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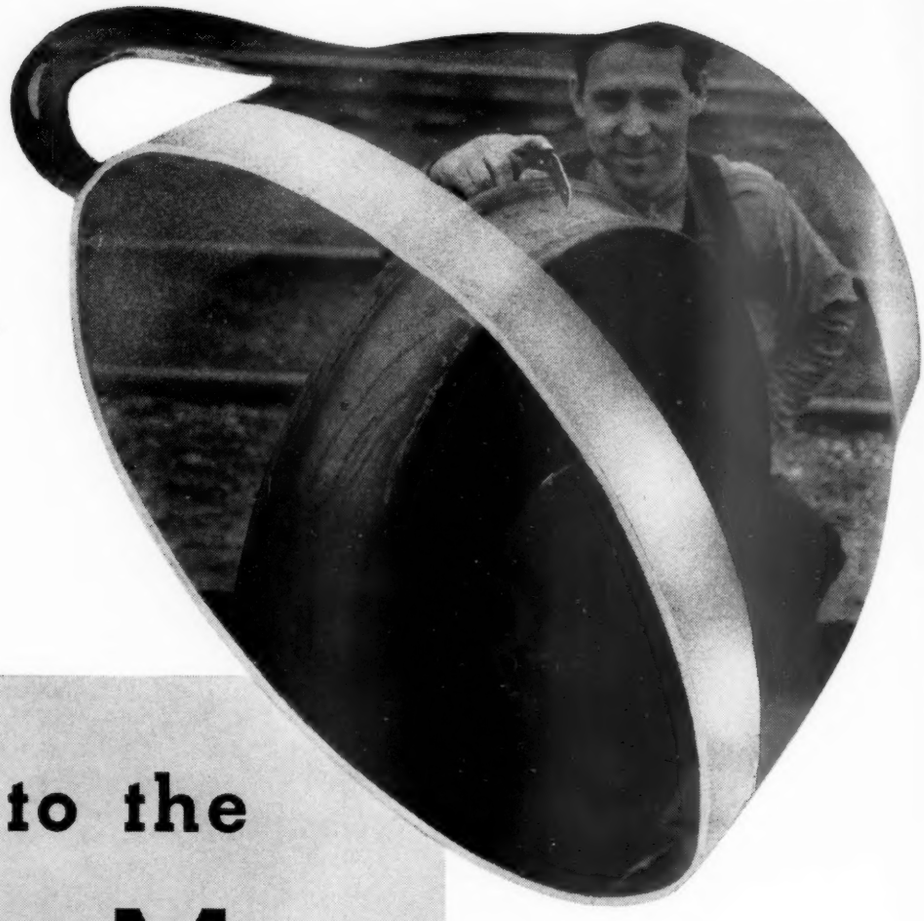

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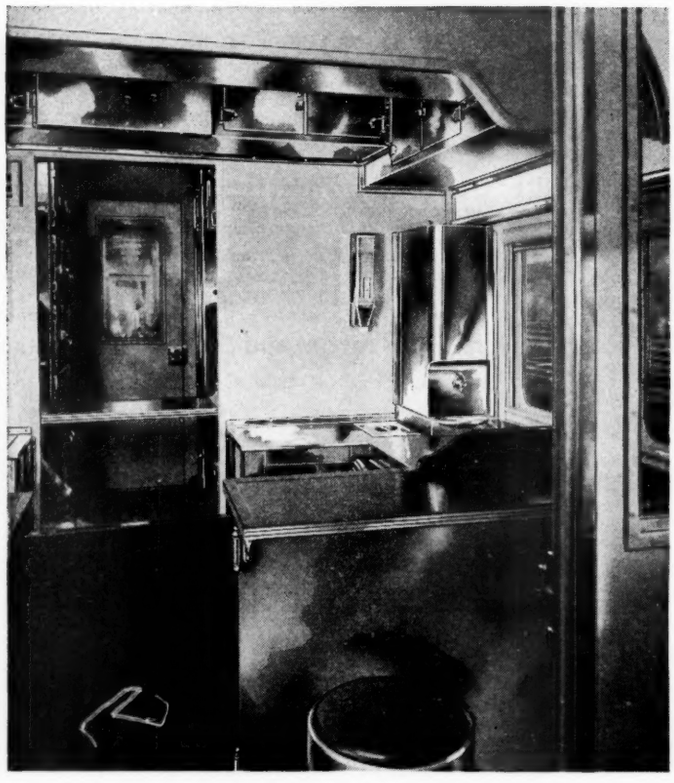

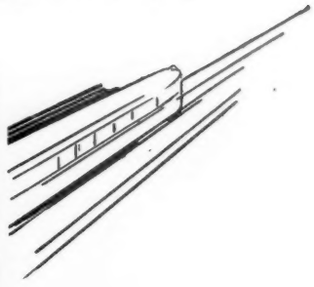

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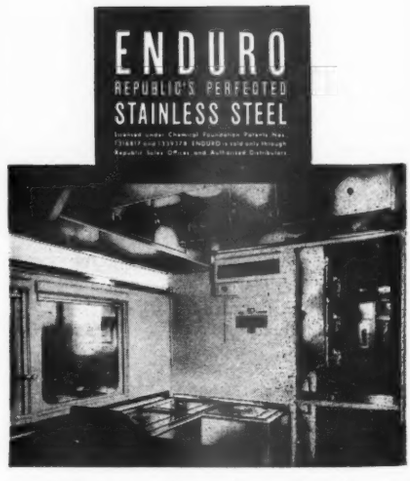


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# The "New Deal" and the Railroads

Congress has adjourned its long session after having, influenced by the Roosevelt administration, passed various measures affecting the railways both favorably and adversely. The railways cannot complain about the attitude of this administration toward them as compared with the attitude of previous administrations, Democratic or Republican, or as compared with its attitude toward most other industries. It has shown more disposition to promote legislation especially to help the railways than any other administration for a quarter century. Its influence helped cause passage of the motor carrier regulation act. Its influence, especially through Co-ordinator Eastman, was exerted for legislation to promote railroad financial re-organizations, for the regulation of water carriers and for modification of the long-and-short-haul section of the Interstate Commerce Act. Much legislation adverse to the railways has been, however, effectively promoted by the administration; and the adjournment of Congress has left the railroad industry confronted with one of the most serious situations in its history.

### Some Encouraging Factors

There are favorable factors in the situation. Effective regulation of motor carriers will undoubtedly enable the railways to recover traffic from the highways and arrest the attrition of rates that has been caused by cutthroat highway competition. Freight earnings are being made somewhat larger than they otherwise would be by the small advance in rates authorized by the Interstate Commerce Commission. The trend of general business, and consequently of car loadings, is upward. In the first two weeks of July loadings were only 54 per cent of the 1925-1929 average, 13 per cent less than in 1933 and 7½ per cent less than in 1934. During the subsequent five weeks they were 56 per cent as large as in 1925-1929. In the week ending August 17 they were 57 per cent of the 1925-1929 average, larger than in 1934 and only 4½ per cent smaller than in 1933. This is the first time that their trend has been upward in the second half of any year since 1932, and it seems reasonable now to anticipate, especially in view of the unusual increase occurring in industrial production, that it will carry freight business higher in the fall than in any year since 1931. Another encouraging factor is the trend of passenger earnings, which increased more than $6,000,000 in the first five months of 1935. The fact that they declined only slightly in June is encouraging, because there was no Century of Progress fair to stimulate them, as there was in 1933 and 1934.

### Railways Hard Hit by "New Deal"

The unfavorable factors are principally in operating expenses. In its August bulletin the National City Bank of New York gave statistics regarding the net profits earned in the first halves of 1934 and 1935 by 260 corporations in various industries. The increase in their aggregate net profits—after depreciation, interest, taxes and other charges, but before dividends—was 18 per cent. The comparable net income *deficit* of the Class I railways increased in the first five months of the year from $29,336,259 to $56,618,534 or 93 per cent. This increase in railway deficit was entirely due to increase in operating expenses. Gross earnings increased more than $7,000,000, but operating expenses increased $39,000,000. The financial results reported for June, July and August will be relatively no better.

Railway operating expenses had been increased before Congress adjourned by almost every important policy directly or indirectly attributable to the federal government during the last two years. NRA increased the average price paid by them for coal (excluding freight charges) from $1.54 per ton in the first one-half of 1933 to $1.77 in the first one-half of 1934, and to $1.89 in the first one-half of 1935. Based on actual consumption, these advances in prices increased what the railroads had to pay for coal $8,300,000 in the first half of 1934 and $12,500,000 (over 1933) in the first half of 1935. It is estimated that the Guffey coal bill recently passed by Congress will further increase the railroad fuel bill $7,000,000 to $10,000,000 a year. The restoration of railway wages completed on April 1 is costing about $13,000,000 a month. The railroad retirement acts recently passed by Congress would cost in the first year about $60,000,000. Thus the advance in wages, and increased costs of fuel and pensions, if the new legislation affecting these costs should be held constitutional, will increase operating expenses over 1933 at an annual rate of at least $250,000,000 a

year even on the basis of present traffic, including nothing for other advances in costs due to the continuing effects of advances in material prices under NRA.

In spite of the favorable attitude of the administration toward them, the railroads actually have been harder hit by its New Deal policies than any other industry, excepting, perhaps, the railway equipment and supply manufacturing industry, which is dependent upon railway buying for its business. The average number of railway employees in the four months April—July, 1935, inclusive, following complete restoration of pre-depression wages, was about 40,000 less than in the corresponding months of 1934. Railway buying from manufacturers has been sharply curtailed, resulting in corresponding curtailment of employment in industries from which they directly and indirectly make purchases.

### Must Have Increased Gross or Reduced Expenses

The railways obviously must have an increase of gross earnings or a reduction of operating expenses. The only way they can get a sufficiently substantial increase of gross earnings to solve their present acute problem is through a large expansion of industrial production that will correspondingly increase their freight car loadings. Perhaps this will occur as it did in the latter half of 1932, when car loadings in October were 31 per cent larger than in July and net operating income increased from $11,600,000 in July to almost $64,000,000 in October. If large increases of car loadings should not soon occur and be in prospect, it would appear that railway managements will have no reasonable alternative to seeking a reduction of wages. There is no other means by which, excepting an increase of traffic, the downward trend of railway employment, net operating income and buying can be arrested.

### Managements Have a Duty to Perform

A movement for reduction of railway wages would be strongly resisted at the present time by politicians in and out of Congress, including labor leaders, who recently have devoted themselves so largely to passing, or promoting the passage of legislation ostensibly in the interest of the working class. It is to be feared it would be regarded unfavorably by the Roosevelt administration, although this might not be the case if the effects being produced by the present railway situation upon production, general business and employment were adequately and forcibly presented. But railway managements have a duty to perform to their security owners, the unemployed and the public. Their duty is to take the initiative in behalf of policies which will tend to restore the earning, employing and buying capacity of the railroad industry. Only by making the railroads a self-supporting industry can their solvency and employing and buying power be assured. Only by making them a self-supporting industry can ultimate government ownership be prevented.

The problem presented is a great national problem full of difficulties and dangers; but a policy of wishful thinking and drifting will not solve it. It must be intelligently and courageously attacked in the near future if the danger of government ownership is to be reduced.

## Transverse Fissures

Nearly 24 years have elapsed since the late James E. Howard, engineer-physicist with the United States Bureau of Standards, first called attention to the transverse fissure as a distinct type of rail failure, in his report on a broken rail that had caused a disastrous wreck at Manchester, N. Y., on August 25, 1911. In the interval that has since elapsed, this type of failure has become increasingly frequent, a total of 74,405 fissures having been recorded in the admittedly incomplete records of the American Railway Engineering Association prior to December 31, 1933. Of these, 9,124 were reported during the single year 1933.

In the interval of nearly a quarter century since this defect first came to light, many more or less sporadic attempts have been made to determine the cause of this highly dangerous form of failure. Efforts have also been made to devise a means for detecting it before collapse occurred.

One of the concerted attacks on this latter phase of the problem was initiated when the Rail committee of the American Railway Engineering Association enlisted the co-operation of the late Elmer A. Sperry in devising a means of determining the presence of fissures within rails, which efforts led to the development of the detector car, several of which are now employed regularly in disclosing the presence of fissures in rails in operated tracks. Through this means thousands of fissures are now being located and removed from tracks before they attain such a size as to cause failure of the rail.

Valuable as this device is for detecting fissures after they develop, it is still more important to determine and remove the conditions that produce them. This quest has engaged the attention of experts of the railways and of the manufacturers since 1931, when they jointly undertook a most exhaustive study at the University of Illinois. It has involved research of a high order that has occupied the time of a staff of some 19 persons working for four years. It has involved a wide variety of studies, including the application of rolling loads to single test specimens of rails up to as many as three million stress cycles, and a total application of 250 million cycles by three machines operating night and day for 3½ years. Through these means fissures have been produced in new rails in the laboratory and the conditions contributing to their formation determined.

It is too early as yet to draw conclusions with any degree of finality. In a statement published on a following page in this issue, however, such tentative conclusions as can be drawn demonstrate that progress is

being made. Especially important, and equally disconcerting, is the fact that field observations of trains in operation show that the conditions promoting the development of fissures in service are more common than has heretofore been appreciated. It appears that changes in mill practices may be necessitated to remove conditions leading to the formation of shatter cracks, and some of the mills have already gone far to accomplish this. Equally important, it appears that the railways must give greater attention to the maintenance of wheels as well as tracks to avoid the dynamic increments in wheel loads that result from flat wheels, irregularities in track surface, etc.

This study constitutes an effective answer to those critics of the railways who have contended that the roads are not research-minded. It is only to be regretted that the committee withheld publicity for so long, and thereby deprived the railways of the benefit of this example in refuting unwarranted criticism.

# The Co-ordinator's Freight Traffic Report

The three volumes of the Federal Co-ordinator's report on freight traffic comprise the formidable total of 702 pages. Yet, in spite of the many demands on the time of a railway executive in these days, this report warrants his study. This statement is not intended to convey the idea that the report merits entirely uncritical praise; but the volumes do contain, in relatively concise form, a highly illuminating picture of the freight traffic situation of today in its many ramifications and complexities.

Perhaps it is unavoidable, but it is unfortunate that these reports are written in dogmatic, pedantic style with the more or less plain implication that railway executives know little about their own business. This should not, however, be permitted to prejudice railway officers against the report as a whole, since it contains many recommendations, with supporting data, that are worthy of most serious consideration.

One of the most important features of the report is the charge that the present freight traffic sales unit—the carload—is obsolete and no longer adapted to commercial needs. Quoting from the report, "The present carlot sales unit and minimum weight requirement are no longer adapted to commercial needs, and are conducive to uneconomical loading. . . . Economic and industrial development within recent years has resulted generally in the unit in which manufactured materials are traded becoming much smaller in size."

As long as eight years ago, the proper size of freight cars was the subject of a survey conducted by the *Railway Age*, with most interesting results. At that time, when highway competition was confined largely to less-than-carload and short-haul traffic, the preponderance of opinion in the West was that the larger type box cars were the most efficient, while in the eastern manufacturing districts 30 tons was generally held as the most efficient traffic sales unit. Even then, though, there was a minority in favor of still lower minima.

Since that time trucks have entered the carload field. To deny that their activities have changed the picture is merely to hide one's head in the sand. On many commodities the present carload minima are not the traffic sales units now used by the shipper. To cling to them stubbornly is but to invite ruin, for the shipper now has available another traffic sales unit, the capacity of a truck, which more nearly meets his needs in this regard. There can be little question but that much of the loss of traffic to highway competitors is directly chargeable to this factor.

Whether containers provide a panacea, as advocated in the report, may be open to doubt. However, the number of roads that have been using containers for some years is sufficient to provide a laboratory from which complete information should be available as to the results. In this, as in the recommendations for the making of cargo rates, the Interstate Commerce Commission will also doubtless have much to say.

The Co-ordinator's report also refers to the desirability of cargo rates. At the present time this type of rate-making is specifically prohibited so far as rail transportation is concerned, and before it can be made effective it will be necessary for the Commission to formulate a new basis which will give the shipper of multiple cars a more favorable rate than the shipper of a single car. Whether this will be considered to be sound public policy is yet to be seen.

Whatever the remedy, however, there can be no doubt as to the existence of the disease. The statement in the report that the present carload minima are not suitable to present-day needs is proved rather convincingly. The report goes further as to suggested remedial steps, giving a complete and valuable summary of numerous devices which have been developed in an attempt to solve the problem.

Co-ordination of facilities is touched upon, but, in view of the labor clause in the Emergency Transportation Act, this report, like others on the same subject, is necessarily vague as to where and how the savings will be effected. The chief and, in many cases, the only savings possible through co-ordination of facilities lie in payroll reductions. No amount of verbiage can conceal this obvious fact, nor can it alter the situation. The railways, quite of their own volition, were proceeding toward the efficient co-ordination of facilities and the elimination of needless duplications of service when the labor clause put a definite stop to such activities.

The suggestion of co-ordinated routing to eliminate circuitous routing does not come under this head. Here there are opportunities. The frantic, if natural, search for traffic during the depression years has increased

circuitous routing. The multiplicity and complexity of the routes available and used in the transcontinental movement of perishables is an example. That there is waste seems evident, but just what is the solution?

The Co-ordinator's idea of selecting two or three railways between certain cities as the routes over which all freight moving between these two cities shall be handled by rail is a logical solution in theory, but it would be fraught with difficulties in practice. Apart from the cry that would go up from shippers if their right to choose how their shipments should move were taken away from them, it could well mean that a number of bridge lines would be deprived of their through business. Such railroads also serve many local communities in the role of the only rail transportation facility, and their local business is by no means sufficient to keep them in operation. One wonders if the Co-ordinator contemplates a wholesale line abandonment, and, if so, how he proposes to appease the public in communities served only by the lines to be abandoned. This is a question that goes far deeper than the report would indicate.

As to the motorization of terminals and station-to-station service by trucks, most of the Co-ordinator's recommendations are in effect on some railroads in the country, and, it might be added, with excellent results where they have been tried. When the Co-ordinator states that they have not been tried in enough places, he is treading on sure ground. Most railways did permit the highway transportation parade to go by them, and, again speaking generally, they are displaying a certain amount of lethargy in catching up.

As stated above, this report constitutes a contribution of great value. It warrants careful, sympathetic study in order that no meritorious suggestions may be ignored.

# British Railways Winning Battle with Competitors

The British railways today provide a striking answer in the affirmative to anyone who may question the ability of privately operated railways to hold their own under conditions of trade depression and in the face of keen highway competition, where traffic is predominantly in passengers and short-haul freight of a kind suitable for handling by motor vehicle. The railways there are not, to be sure, overwhelmed with prosperity, as measured by the market price of their common stocks. But the underlying securities of all of them command good prices and, compared with the average financial status of railways in this country, the British companies are fortunate indeed.

It is not, however, the condition of an institution at any one time which measures its health, but rather the direction in which it is tending. And in this respect the British railways are definitely in the ascendant. They are not, on the average, losing traffic—either freight or passengers—to the highway. Instead, they are constantly regaining it. They are even, by the use of containers, regaining the household removal business—adapted as that type of movement is to highway handling. They have not lost their hold on the public imagination; rather the British public is more "railway minded" than ever. Railway advertising and publicity activity is wide-spread and intensive, every conceivable medium for reaching the public being used. The fact that all collection and delivery of freight is done by railway vehicles gives the railways an unexcelled publicity medium, since a considerable percentage of these vehicles are also used (as the Railway Express Agency in this country uses its trucks) as "moving billboards" for posters advertising railway service. A press in receipt of liberal advertising patronage from railways tends to deal generously with them in its news columns (particularly when public interest in the industry is so intense that its developments have a definite news value).

There are many features of British railway practice that American railway men would question—such, perhaps, as hauling coal in 12-ton cars. But when it comes to giving the public a service which it will use in large quantities at prices which they will pay, and exploiting that service so intensively that the drift of traffic to the highway has been definitely reversed—the British railways have done a magnificent job, and their methods could undoubtedly with great profit be emulated, to some extent at least, on this side of the Atlantic.

Among these methods, certainly must be included intensive use of advertising and publicity, *which in no case is competitive as between railways* but is solely directed to getting traffic to move by rail. Nor can the fact be avoided that the light 4-wheeled car is a more efficient unit for l.c.l. traffic than the large American box car. (The ratio of net to tare being secured in l.c.l. service in Great Britain is 38 per cent, as compared with approximately 15 per cent in this country). Excessive wage costs per train-mile with our crews of five men are avoided in Britain, where there are only three men—engineman, fireman and one trainman—in a crew. The railways are thus able profitably to operate smaller and more frequent train services than we are in this country—a feature which is a great help in meeting highway competition.

Our railways, in short, while they probably cannot learn much from England about the efficient handling of heavy bulk traffic, can learn a great deal about easing the pain in the place where the competitive shoe pinches worst, namely in passenger and merchandise traffic solicitation and handling. Toward this end we propose to publish during the coming months some first-hand observations of the success attained in Britain in overcoming competitive obstacles which are still very much with us on this side of the Atlantic.

# First Published Report on Joint Investigation of Fissured Rails

**Professor H. F. Moore reviews results of research work conducted under auspices of the A.A.R., the rail manufacturers, and the University of Illinois**

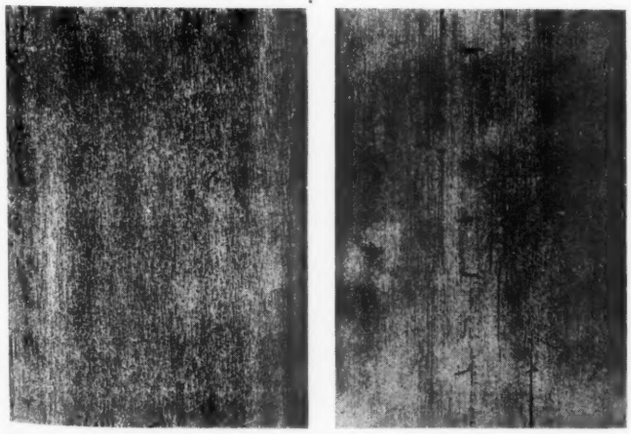
FISSURES in rails usually originate at shatter cracks that form in the rails during manufacture. The growth of these fissures is the result of stresses produced by the combined effects of bending and direct wheel pressure in service, and the latter is by far the more important factor.

Internal fissures have been developed in the laboratory in rails containing shatter cracks, under conditions approximating those to which rails are subjected in actual service, with a wheel load as low as 40,000 lb. Field tests involving observations on 90,000 car wheels in regular train operation indicate that actual load effects of 40,000 lb. or more may occur as frequently as one wheel in a thousand.

Tests of rails that were given special thermal treatment before or during cooling showed an almost complete absence of shatter cracks and none of them developed an internal fissure under a million or more repetitions of a rolling wheel load test of 75,000 lb.

There is a total lack of uniformity in the distribution of shatter cracks in the rails of a heat, in the cross section of a rail, or throughout the length of the rail. Furthermore, no non-destructive test has yet been devised that will disclose their presence in a rail.

The stresses set up in rails that result in the development of internal fissures are practically independent of the size of the rail.



Specimen Etch Tests of Two Rails—Rail with Shatter Cracks on the Right, Rail Without Shatter Cracks on the Left

These are among the facts set forth in a progress report by Professor H. F. Moore, in charge of the test party of the Joint Rail Investigation of Fissures in Railroad Rails, which has just been issued in Bulletin 376 of the American Railway Engineering Association. This report comprises the first published record of the results of four years of intensive research in this field that was initiated by the railroads and the manufacturers of rails, who agreed to share equally in an expenditure of $250,000 for this purpose over a period of five years.

### A Comprehensive Research Project

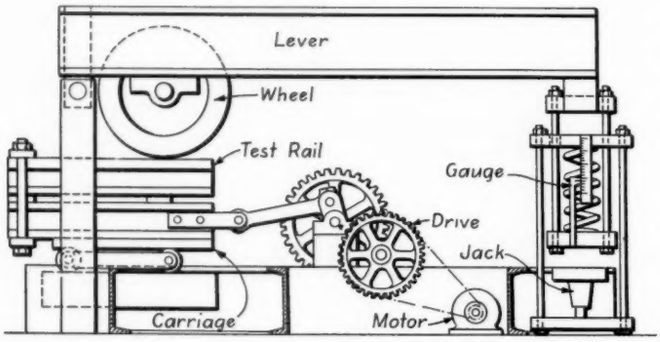
The investigation was organized under the auspices of the Rail Manufacturer's Technical Committee and the American Railway Association (now the Association of American Railroads), acting through the American Railway Engineering Association. The Engineering Experiment station of the University of Illinois was asked to undertake the investigation under the direction of Professor Moore, research professor of engineering materials. He has been assisted in this investigation by a staff of 19 persons, including specialists in physical, metallurgical and mathematical research, laboratory assistants and mechanicians. He has also had the cooperation of an advisory committee consisting of 10 railway engineers and 8 engineers and metallurgists representing the manufacturers, Earl Stimson, chief engineer maintenance of the Baltimore & Ohio, being chairman of the railway group and F. W. Wood, Baltimore, Md., being chairman of the manufacturers' group.

The report is prefaced by a review of earlier investigations, particular reference being made to research work conducted at the University of Illinois in co-operation with the Utilities Research Commission of Chicago some two or three years prior to the present investigation. The main results of that investigation were: (1) the design of a rolling-load testing machine, which, with a few changes in details, had been adopted by the present investigation, and (2) the development of the mathematical theory of the stresses directly under a wheel load. The results of this earlier investigation are summarized in the report as follows:

> Damage to railroad rails can be caused by either of two quite distinct systems of stress: (1) Flexural stress set up by the bending moment in rails and (2) a complex system of stresses set up directly under a wheel load. The investigation of Professor A. N. Talbot, chairman of the Joint Committee of

the American Society of Civil Engineers and the A.R.E.A. on Stresses in Railroad Track, gave the necessary mathematical analysis for computing the flexural stresses, but to compute the stresses directly under a wheel it was necessary to develop an extension of an earlier mathematical analysis for pressures and stresses in two cylinders whose axes were at right angles to each other. This was carried out by V. A. Hoersch of the Department of Mathematics, University of Illinois, and his mathematical results were arranged for engineering use and checked by strain etch tests by Professor H. R. Thomas.*

An internal fissure in a rail suggests that shearing stress may be the cause since the shearing stresses tend to become a maximum toward the center of cross-section of a beam. Actually these stresses are modified by the fact that there is plastic action near the tread of the rail so that the actual stresses are lessened near the tread of the rail. However, there is evidence that




Testing Machine for Rolling-Load Tests

there is fair agreement between theoretical stresses and actual stresses at a depth of one-half inch below the tread of the rail.

### General Divisions of the Investigation

In attacking the problem of internal fissures in rails under the present project, the work was sub-divided under the following general heads:

(1) A laboratory study of the mechanism of the formation of internal fissures in rails under repeated wheel loads.

(2) Field studies of the range of magnitude of wheel loads found in service.

(3) A critical study of acceptance tests for rails at the mills, and a study of the problem of a non-destructive test for rails.

(4) Tests of rails made by special processes designed to prevent internal shatter during manufacture. Such processes are now commercially available.

(5) Service tests under traffic. These are now in progress, and the results after some years may modify some of the conclusions drawn from laboratory tests.

These lines of study have occupied the full time of a score of people engaged in a wide variety of investigations. Because the project was concerned essentially with a search into the unknown, a large part of the time of the staff was occupied in exploratory work, or in running down the possibilities of every conceivable suggestion that offered any promise of developing some fruitful results.

Of more popular interest, however, is the scope of some of the more routine phases of the project, for example, the magnitude of the rolling-load testing of rail specimens. This involved the operation of three machines night and day for 3½ years, during the course of which individual specimens were subjected to as many as three million cycles of stress, or a total of some 250 million cycles for the three machines for the 3½ years.

The investigation also involved a large amount of chemical analysis, metallographic examination and physical testing of samples of rail steel. Fully 1,200 photomicrographs were taken, some of them to magnifications of 2,000 diameters. Tests of physical properties included four months of work in a cold room at temperatures as low as —53 deg. F.

The determination of the magnitudes of actual wheel loads has involved the taking of data and laborious computations covering more than 90,000 individual wheels of cars in regular train service. Much time has been spent, also, at the mills in the study of mill practices.

* The results of this analysis are given in Bulletin 212, Engineering Experiment Station, University of Illinois.

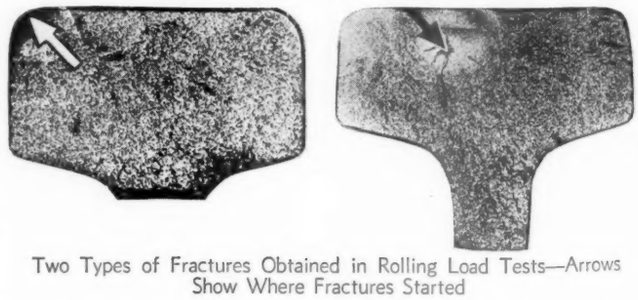
## Abstract of the Report

At the outset of the investigation five different mills furnished 165 130-lb. rails and 130 110-lb. rails for test purposes. These rails were from various heats, and the remainder of the rails rolled in these test heats, amounting to something like 12,000 tons, were sent to various railroads to be put in service in different locations, and to be subjected to careful observation, and occasional tests for possible fissure developments.

In addition to these test rails, 36 pairs of "companion" rails were obtained. One of the rails of each pair was cooled on the hot bed, as is the present practice in rail rolling, and the other was subjected to some form of heat treatment designed to prevent the formation of shatter cracks. There have also been received 3 rails of special alloy steel, and 164 rails that have been in service.

It is to be remembered that failure by an internal fissure of any kind is essentially a progressive fracture or "fatigue" failure as it is commonly called. The experience of many laboratories studying the phenomena of fatigue of metals confirms the opinion that localized stress at discontinuities, such as notches, deep scratches, and cracks, is, perhaps, the commonest source of fatigue failures in parts subjected to repeated stress. It would seem then if any newly-rolled rail contained some cracks inside the head, or highly strained areas which became cracks under service conditions, that these cracks would be especially likely to serve as nuclei for spreading fatigue failures. Hence, at the outset of the investigation all newly-rolled rails received were subjected to examination for such "shatter cracks," as they are commonly called.

A piece 6 in. long was taken at a distance of 30 in. from one end of the rail, and the head of this piece of rail was cut up into horizontal slices about ¼ in. thick. These slices were etched on both sides. Out of the etch tests of 258 new test rails weighing 130-lb. or more per yard, 73 showed shatter cracks, while of 140 new test rails weighing 110-lb. to 112-lb. per yard, 27 were found to contain shatter cracks. The percentage of shatter-cracked rails in the regular output of a rail mill should not be judged by these figures, however, for sev-



Two Types of Fractures Obtained in Rolling Load Tests—Arrows Show Where Fractures Started

Specimen on the Left Was Free From Shatter Cracks—Fracture Started at the Surface.
Specimen on the Right Was Shatter-Cracked and Fissure Failure Started From an Interior Nucleus.

eral of the manufacturers sent test rails from heats of steel produced under unfavorable conditions, realizing that such rails were specially suitable for study.

### Testing Machine for Developing Fissures

The laboratory study of the mechanism of internal fissures in rails was carried on principally by means of special testing machines for applying repeated cycles of wheel load and bending moment to specimens of rails. In a laboratory test it is essential that the apparatus used shall be capable of giving definite quantitative measurements, and it was felt that a machine which produced combinations of direct wheel load and of bending stress would be the most effective machine for the study of the formation of fissures. In this machine a short specimen of rail is pulled backwards and forwards under a wheel load which can be varied from zero to 80,000 lb. The machine is so designed as to permit of ready determination of the load applied and the bending moment in the rail. A revolution counter is attached to the crankshaft of the machine, and an automatic cut-off switch is operated by the drop of the lever when a specimen fails. The stroke of the machine is 7 in. and its speed 55 revolutions per minute.

Tests of short lengths of rails under repeated rolling load in these machines have developed failures starting from internal fissures in a considerable number (although by no means all) of the newly-rolled test rails which were found by means of etch tests to contain shatter cracks. No failures starting from internal fissures have yet been developed in the laboratory in newly-rolled rails which etch tests have shown to be free from shatter cracks. Such uncracked rails, when they fail under repeated rolling load, fail by a fatigue crack starting from the surface. Moreover, they require higher wheel loads to cause fracture than do shatter-cracked rails. Altogether some 205 rails have been tested in the special rolling-load testing machines, many of them to 1,000,000 cycles of stress, or more.

### Fissures Developed in Shattered-Cracked Rails

In laboratory tests of rails in the rolling-load machines fissures have been developed under the wheel load at sections where bending moment was very small, but never, even in shatter-cracked rails, at sections of heavy bending moment outside the path of the wheel load. Hence it seems clear that the stress under the wheel load on the rail is a factor of prime importance.

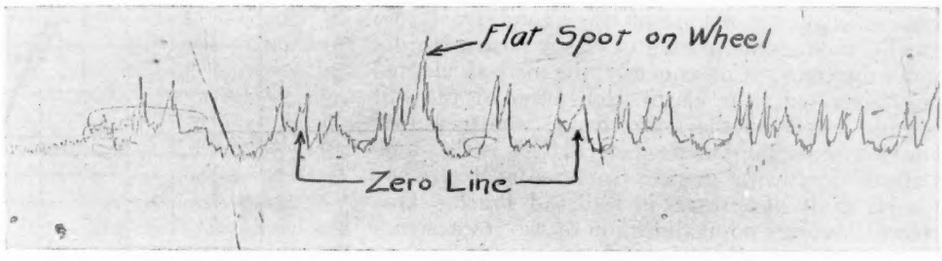
In the laboratory tests of new rails in which etch tests had shown shatter cracks, internal fissures have been developed under repetitions of a wheel load as low as 40,000 lb. By the use of the formulas developed for the study of stresses in rail directly under a wheel load, it can be shown that the theoretical shearing stress at the zone where internal fissures usually develop is just about as high, for a wheel load of 40,000 lb., as the repeated shearing stress necessary to develop a fatigue failure in rail steel in which there is a small crack. As shown by fatigue tests of specimens of rail steel with and without cracks, the effective stress concentration at the edge of a small crack reduces the fatigue strength (endurance limit) of rail steel about 50 per cent. The endurance limit of uncracked rail steel subjected to cycles of shear varying from zero to a maximum (but not reversed) was found from fatigue tests of specimens to range from about 55,000 to 65,000 lb. per sq. in. This means that the range of endurance limit under repeated shearing stress for steel with a small crack ranges from 27,000 to 32,000 lb. per sq. in.

It will be noted that 118 specimens in which etch tests had shown no shatter cracks failed by fatigue failure starting from the surface, and that all but 11 of these 118 specimens failed at stresses below the range of endurance limit for repeated shear for uncracked rail steel.

### Tentative Conclusions

In view of the wide variation of shearing stress due to various depths of shatter cracks found in rails, the picture of an internal fissure starting from intensified shearing stresses at a shatter crack seems consistent and convincing.

At the present time, and subject to revision of belief by final results from the test rails in service, it is felt that the investigation has yielded fairly convincing evidence that fissures in rails usually originate at shatter cracks which form in the rails during the process of manufacture. All laboratory-developed fissures were in shatter-cracked rails, and about 75 per cent of the service-fissured rails sent to the investigation showed evidence of shatter cracks outside the main fissures. Of course, this does not mean that all shatter-cracked rails develop fissures—a shatter-cracked rail has considerable strength, and doubtless many such rails have worn out in service before they had received enough severe stresses to develop a fissure.




Reproduction of a Portion of a Scratch Extensometer Record Taken Under a Passing Freight Train—Magnified About 150 Times

The results of rolling load tests, as has been pointed out, show that the start of a destructive fissure seems to be due to the direct action of wheel loads rather than to bending stress. The mathematical analysis of stresses due to this direct action of wheel load, which is shown to agree very well with rolling-load test results, indicates that the stresses set up are practically independent of the size of rail. Hence, it seems that the starting of fissures would not be hindered by the use of heavier rails, except in so far as they might make track conditions smoother and reduce the "dynamic augment" of wheel loads. They could not be expected to reduce the wheel loads due to flat spots on wheels. Heavy bending moment tends to cause transverse fissures, while heavy wheel loads and low bending moment tend to cause horizontal or diagonal fissures.

### Tests of Metal in Rails

A large number of physical tests have been made on specimens cut from rail heads, including tension tests, impact tests (on both notched and unnotched specimens), and fatigue tests (including flexure tests, torsion tests, and direct tension-compression tests with varying ranges

of stress). Of special interest were the comparative results of tests of steel from the heads of newly-rolled rails in which etch tests had shown the presence of small "shatter cracks" in the head of the rail, and of steel free from such shatter cracks.

Shatter cracks, if present, are found in the center of the head of a rail and not near the surface. Hence the difference between the physical properties of specimens from near the surface and the properties of specimens from the center of the head should throw light on the effect of shatter cracks on the strength and ductility of the metal. The general result of these tests of specimens cut from rail heads is to confirm the conclusion that the defect known as a shatter crack is a material factor in lowering the resistance of steel in a rail head to the spread of a crack under repeated applications of load.

### Actual Wheel Loads in Service

The nominal wheel load on any wheel in a car or locomotive is the dead weight that it carries. This is known with a fair degree of accuracy. The actual wheel load at any given point in track may vary widely from this nominal wheel load due to the inertia forces set up by lack of balance of rotating parts, the closing solid of springs, flat spots or out-of-roundness of wheels, and irregularities of track surface, ballast, and subgrade conditions. These conditions may make the actual wheel load less than the nominal wheel load at some points and greater at others. It is the increase in wheel load which is of most importance in considering strength of rail, and this increase of actual wheel load over nominal will be spoken of as the "dynamic augment."

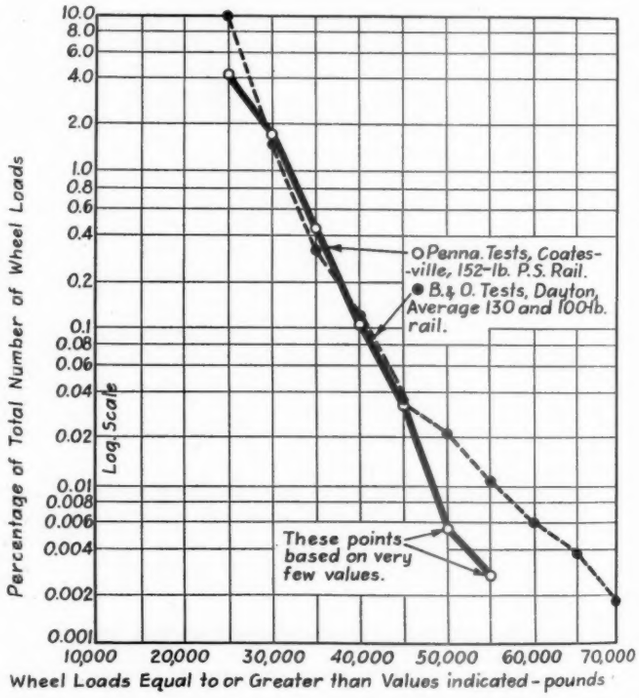
Direct measurement of wheel load would be highly desirable, but all methods considered for this direct measurement involve a change of track conditions from the normal,—such as the placing of elastic measuring devices under the track. Consequently, the method adopted was an indirect one; the elastic elongation of the rail along a gage length on the lower flange was measured by means of a recording extensometer. This is the same measurement used with marked success by Professor Talbot in his study of Stresses in Railroad Track. This measurement involves no modification of the track structure at all, and, by use of the formulas developed by Professor Talbot, it is possible to reduce the readings of elastic elongation in flange to wheel loads on the rail at that point. The instrument used in measuring strain in the rail was the DeForest scratch extensometer. The reduction of measurements of elastic elongation of flange to wheel load involves somewhat tedious mathematical computations, and the reduction of data take a far longer time than the obtaining of data.

### Tests for Wheel Loads—Preliminary Results

The measurement of wheel loads in service involves the gathering of a rather large amount of "statistical" data. Estimates of maximum, minimum and average service values must be based on a large amount of observed data, and must at best be estimated rather than precisely measured. This fact must be kept in mind in studying the preliminary results of data for wheel loads in service. They are based on observations on two different locations: (1) On the Baltimore & Ohio just north of Dayton, Ohio; and (2) on the Pennsylvania at Coatesville, Pa. Most of the observations have to do with freight car wheel loads (of trains in regular service), and it may be noted that at these two locations actual loads from imperfect car wheels were found to be as high as any loads observed under locomotive wheels. At Dayton the records obtained were based on 53,659 loads at 17 test locations for instruments, and at Coatesville on 36,900 wheel loads at 8 test locations for instruments. The general results of the tests are shown in the accompanying diagram.

The tracks in both locations were in fairly good condition and were laid with heavy rail. The rolling stock, also, represented about average conditions. Referring again to the results of rolling-load tests in the laboratory, it would not seem unreasonable to assume that any wheel load above 40,000 lb. be regarded as one which, repeated often enough, might spread a shatter crack into a transverse fissure.

With ideal maintenance of track and with ideal inspection of rolling stock there would still be some "dynamic augment" of wheel load due to the deflection of track under load. Professor Talbot's test results on stresses in track suggest that *for such ideal conditions* this augment would not, however, be very serious. At present it is not possible to distinguish sharply between dynamic augment caused by imperfect track maintenance and that caused by imperfect rolling stock. The observations at Dayton and Coatesville indicated qualitatively that the effect of flat spots on car wheels was very noticeable and some special tests made later near Wilmington, Del., under wheel loads of electric and steam locomotives have given some indications that variation




Magnitude and Frequency of Wheel Loads, Based on Records Obtained from 90,000 Wheels of Cars in Regular Train Service

in track conditions may also cause appreciable dynamic augment of nominal wheel loads. However, much more detailed work must be done before any quantitative estimates of these two factors are possible. It can be stated with confidence that both are important.

### Acceptance Tests for Rails

Shatter cracks in rails are not uniformly distributed among all rails of a heat; they are found in some rails and not in others; they are found in some locations along the length of a given rail and not at other locations. Obviously a non-destructive test that would locate shatter cracks and that could be applied to every rail of a heat

would be of great advantage, but at the present time no such test is available. The Sperry method will locate *fissures,* but not shatter cracks in rails before they are put in service. The only tests available today are tests of specimens to destruction, and while the tests used are better than no tests at all, they are not capable of assuring freedom from shatter cracks.

The standard strength test for rails is a drop test of specimens from a heat of steel, with the specimen placed head-up. Usually if the specimens withstand the one blow, one of them is subjected to repeated blows until it fractures, the number of blows noted, and also measurements are made of the elongation along the tension edge of the rail. Sometimes head-down tests are used in place of, or in addition to, the head-up tests. The results of drop tests at the University of Illinois indicate that the drop test is not reliable as a detector of shattered rails. The majority of the shatter-cracked rails tested head-down, and all but one of the shatter-cracked rails tested head-up, withstood one blow.

After one or more blows from the drop hammer the test rail is so distorted that subsequent blows set up very complicated bending and twisting stresses, and the significance of the results of the repeated-blow test is quite uncertain. Moreover, the repeated drop test allows for evaluation of results only by "jumps" of about 40,000 ft.-lb. The bend test, which has been proposed by a number of engineers and metallurgists seems to be a distinctly better test than the drop test, although it suffers from the limitations common to all tests to destruction. However, the bend test gives all the data of the drop test, and load values in addition. It is more sensitive, and there is freedom from distortion of specimen between blows.

### Etch Tests

A direct test for the presence of shatter cracks in rails consists of cutting slices from the head of a piece of rail and then etching the slices in hot, strong acid. This etch opens up any cracks and makes them visible. This test, if thoroughly carried out, gives direct evidence of the presence or absence of a shattered condition in the sample tested. Moreover, if it be carried out on several samples of the rail, it gives some indication of whether the shatter cracks are close to the tread or not. The closer to the tread a shattered condition exists the more likelihood there is of its starting a fissure.

Drop bend and etch tests are all tests to destruction. Shatter cracks in rails seem to be localized phenomena, even in a given rail, and like all tests of specimens to destruction, these tests leave an element of uncertainty as to whether any specimen tested is representative of the worst, the average, or the best conditions of the steel in the heat of rails.

The bend test is a better controlled and more sensitive test than the drop test as at present carried out. It is believed that a combination of bend test and etch test requirements would be a distinct improvement over the present drop test requirement for rails.

A very considerable amount of study and experimentation has been carried on in an attempt to find some reliable non-destructive test for shatter cracks in rails, but so far no device has been tried out by the test party which is capable of detecting a cracked area of less than about 0.5 sq. in. Tests have shown some promise of success in using a microphone with amplifier and telephone attached to a cooling rail as an indicator of the occurrence of cracks. At present an attempt is under way to devise a recording apparatus to replace the telephone receiver.

The results of this investigation, as well as the experience of rail manufacturers and users for the past several years, has placed emphasis on the significance of shatter cracks. So far, the processes proposed and in commercial use for the reduction or elimination of shatter cracks are applied to the rails after they have passed the rolls. General observation in steel plants and tests of steel at various temperatures indicate that it is probable that internal cracks occur during the period of the cooling of the rail, and two types of thermal treatment for the elimination of shatter cracks have been carried out on a commercial scale. These two types of treatment are: (1) A controlled cooling of the rail, and (2) the cooling of the rail through its critical range, followed by the reheating of the rail above the critical range to give a grain refinement, followed by cooling in the air—this is a special normalizing process.* Slow cooling means a general reduction of temperature gradient and internal strain throughout the rail, and a gradual adjustment of the metal to equilibrium. A normalizing process can be made to give steel an improved crystalline structure capable of resisting more severe cooling strains.

For the purpose of obtaining a measure of the effect of these thermal treatments on the quality of rail steel, tests were conducted on 36 pairs of rails furnished by various mills. One rail of each pair was cooled in the usual way on hot beds and the other was subjected to some special thermal treatment after rolling.

These included the bend test, the rolling-load test and etch tests for shatter cracks, and indicate that a distinct improvement results from the thermal treatments used, which included (1) slow cooling from various temperatures in an insulated chamber (usually holding about one heat of rails), and (2) a normalizing process after cooling. It was also evident that the majority of rails developed no shatter cracks when cooled in the ordinary manner on hot beds.

* See Railway Age, March 2, 1935, for description of the Brunner normalizing process.

# Truckers Found Ignoring Hours of Service Laws

MANY truckers hauling produce from the South to northern and northwestern points work their drivers very long hours with practically complete disregard for the "hours of driving" laws and regulations of the various states through which they pass, according to a study recently completed by the Eastern Regional Research Division of the Association of American Railroads.

The data on working hours were obtained by checking the running times of trucks; through conversations with drivers; and by checking the Delaware state police truck records. A check made at the Bridgeville, Del., state police weighing station of 62 trucks, bound for New York City—a distance of 196 miles—showed that the average round-trip running time was 17 hours, 42 minutes. More than half of these trucks had their points of origin of their loads from 30 to 125 miles south of Bridgeville. On 10, the drivers had no helpers.

It is a common practice in the Southern area for operators and their helpers to both load and unload. This takes about 4 hours—2 hours at the origin of the load, 2 at the destination. Thus if 2 hours for loading are added to the round trip-time, Bridgeville to New York, the average, or the continuous working period, is increased to 19 hours, 42 minutes. Nor does this total include the running time from the points of origin

to Bridgeville, or the running time from Bridgeville on the southbound trip to the point of origin. Such hours of service violate the laws of New York, New Jersey and Delaware, through which states the greater part of the Southern traffic moves.

From conversations with drivers, it was learned that the average work week ranged from 85 to 125 hours. A number had work weeks of 150 hours, and there were some who stated they were on duty 7 days and nights consecutively, with their helpers alternately driving, then sleeping on the moving truck. Drivers as a group in the Southern area appear unaware that any state but Delaware limits truck operators' hours of service. Yet these operators truck produce in season as far west as Indianapolis and as far north as Boston, from Georgia, the Carolinas, Virginia, Maryland and Delaware.

In Delaware the hours of service regulation is enforced by the state police. All trucks entering the state are required to be weighed at stations located near the state line. The operators are then given cargo passes, on which is marked the weight of the truck, the load carried, the time of the weighing, the origin of the load and the time the truck left the originating point, the destination of the load, the name of the truck owner and the names of the operator and helper.

At various intervals, usually once a week from June to October, the trucks are stopped on re-entering the state and the cargo pass is taken up. A perusal of the slip is sufficient to determine whether the operator has been driving continuously or whether he has taken sufficient time to rest. If the enforcement officer finds that the rest regulation has been violated, the operator is forced to leave the truck for a period of 8 hours. Fines are not exacted. On a day when the police are enforcing this regulation, it is not uncommon to see more than a score of trucks pulled up alongside the road, near a state police station, their drivers asleep on the ground.

The findings of the Association in this respect are in line with those of the National Safety Council in its national study of "Exhaustion and Drowsiness as They Affect Traffic Accidents," published this year in pamphlet form under the title "Too Long At The Wheel." Commenting on the obstacles to enforcement of hours of service acts on the books of 43 states, the Council stated: "Those who might be considered responsible for enforcement of drivers' hours of duty laws often keep the obstacles so well in mind that this in itself becomes an obstacle.

"Local officials, by and large, consider the enforcement of this regulation, like that of the weights of motor vehicles, to be primarily a state matter, and they are likely to neglect it unless they make a practice of increasing the revenue of the community from motor vehicle fines. The state officials, on the other hand, often contend that the enforcement of all motor vehicle laws is up to the local peace officers. The results of this 'buck-passing' are obvious. Some states seriously need a coordination of state officers enforcing this and other motor vehicle regulations. There may be highway department inspectors weighing vehicles, state police checking speeds, inspectors of the department of motor vehicles enforcing licensing provisions, and inspectors of the public utility commission looking out for evasions of special truck taxes without any of these officials feeling the least responsibility for enforcement of the hours-of-duty regulations."

Another excuse for not enforcing the laws, the Council pointed out, "is that the violation was not committed entirely within the state. Thus a public utility commission or a state police department will claim that since the driver only drove two hours within the state—although twenty outside—they cannot make an arrest. The same situation may exist, however, in connection with driving while intoxicated or mechanical defects in motor vehicles; the driver may have done his drinking, or a headlight may have gone bad outside of the state; but they still create a hazard within the state and enforcement officials take action on that basis. The example of Delaware is excellent in this respect. Nearly all of the drivers whose licenses were suspended for too long hours on duty did most of their driving outside of the state."

The Council concluded: "In general it may be said that in the enforcement of hours-of-driving regulations, Delaware is outstanding. The objective there has been safety, and the methods used have been straightforward. They have not aimed to harass the truck drivers, and the rulings were not passed simply to please the people who had theoretical ideas about the control of motor vehicles on the highways. The enforcement has been done economically and apparently has had beneficial results."

# Freight Car Loading

WASHINGTON, D. C.

REVENUE freight car loading in the week ended August 17 totaled 615,006 cars, an increase of 31,263 cars as compared with the total for the preceding week and of 13,218 cars as compared with the corresponding week of last year, but a decrease of 28,400 cars as compared with 1933. All commodity classifications except coke showed increases as compared with the week before, while forest products, ore, and coke showed increases as compared with last year. The summary, as compiled by the Car Service Division of the Association of American Railroads, follows:

**Revenue Freight Car Loading**

For Week Ended Saturday, August 17, 1935

| Districts | 1935 | 1934 | 1933 |
|---|---|---|---|
| Eastern | 128,153 | 124,840 | 143,229 |
| Allegheny | 114,828 | 106,788 | 132,859 |
| Pocahontas | 41,358 | 38,750 | 48,908 |
| Southern | 81,829 | 80,910 | 84,602 |
| Northwestern | 102,521 | 98,192 | 97,019 |
| Central Western | 97,225 | 100,851 | 88,604 |
| Southwestern | 49,092 | 51,457 | 48,185 |
| Total Western Districts | 248,838 | 250,500 | 233,808 |
| Total All Roads | 615,006 | 601,788 | 643,406 |
| Commodities | | | |
| Grain and Grain Products | 42,814 | 39,607 | 28,727 |
| Live Stock | 14,279 | 31,485 | 17,358 |
| Coal | 89,993 | 92,974 | 128,918 |
| Coke | 4,833 | 3,734 | 7,003 |
| Forest Products | 30,540 | 22,584 | 27,349 |
| Ore | 34,556 | 28,668 | 39,511 |
| Merchandise L.C.L. | 159,314 | 159,894 | 169,364 |
| Miscellaneous | 238,677 | 222,842 | 225,176 |
| August 17 | 615,006 | 601,788 | 643,406 |
| August 10 | 583,743 | 603,968 | 629,743 |
| August 3 | 597,083 | 612,660 | 620,482 |
| July 27 | 596,462 | 610,042 | 644,839 |
| July 20 | 593,366 | 616,040 | 656,380 |
| Cumulative Total, 33 Weeks | 19,200,626 | 19,606,054 | 17,736,321 |

The freight car surplus for the last half of July averaged 295,984 cars, a decrease of 21,228 cars as compared with the first part of the month. The total included 178,452 box cars, 73,362 coal cars, 26,209 stock cars, and 6,757 refrigerator cars.

## Car Loading in Canada

Car loadings in Canada for the week ended August 17 totaled 43,101 as against 43,581 for the corresponding week last year and 41,750 for the previous week, according to the compilation of the Dominion Bureau of Statistics.

# How to Increase Freight Traffic Volume and Revenues

## Report of Federal Co-ordinator recommends intensive use of modern equipment and elimination of universal routing privilege

GREATER freight train speed by the elimination of terminal delays, increased use of motor transportation by the railways, reduction of the present carload unit through the use of containers, the establishment of cargo rates for trainload shipments, and the simplification of tariffs and classifications, are highlights of the report on freight traffic issued by the federal co-ordinator on June 7 and summarized briefly in the *Railway Age* of June 8. The report consists of three volumes, one containing a general resume of freight traffic, the others being factual summaries of the returns to questionnaires issued by the co-ordinator's office. The three volumes comprise more than 700 pages, with illustrations. The report includes a section dealing with all the varieties of rail-highway co-ordination vehicles now in use, or being developed in this country or abroad. It also includes a study of highway transportation costs, with profuse charts.

### Breaking Down Carload Unit

One of the most interesting suggestions in this report concerns the elimination of the two classes into which freight has hitherto been divided, namely, carload and less carload. It is recommended in the report that the container of 10 tons' capacity be considered in the future as the "carload" unit. Considerable data are presented in support of this idea, which would contemplate the loading of five such containers per car on specially built flat cars. Proceeding on this basis, the present carload minima would be maintained for such commodities as are normally and more efficiently transported in lots of 25 tons or over. It is contended that the reason and the necessity for this re-arrangement of the classification of freight shipments is to be found in the fact that highway transportation, since it has begun to compete for carload traffic, has rendered the former classification of freight into carload and less carload lots practically obsolete, and that this fact must be realized by the railways if they are to regain the traffic lost to the competing highway transportation companies. Apart from the fact that the container, according to the report, is the proper unit for handling much of the freight traffic now moving, it is additionally recommended as being easily transferred from rail to highway or waterway, or vice versa, and so of great efficiency in accord with the report's recommendations for increased use of devices that will co-ordinate rail-highway service.

In addition to the above, the report strongly recommends a ruling by the Interstate Commerce Commission permitting the quotation of rates lower than any present commodity or carload rates on "cargo" shipments; that is to say, on shipments amounting to approximately 30 carloads, under the present definition of the term. The report states that, from the information at hand, it was impossible to do more than approximate the extent to which cargo shipments of petroleum, grain, coal, lumber, ores, perishables, etc., would move by rail. Out of a total available tonnage of 241,000,000 tons of petroleum and its products handled by all carriers in 1932—the year used for all comparisons in the report—it is estimated that an amount equal to over more than one-third the total rail tonnage, in excess of 150,000,000 tons, was handled in cargo lots, for which the railways had no tariffs.

### Rates and Classification

The report states that there is an entirely unnecessary complexity in rates and classifications that should be ironed out, and reports as follows on a suggested classification:

> In classification processes, all cost elements should be eliminated and the value of the service element alone be considered; all commodities should be classified first into primary groups on the basis of utility, in order to prevent discrimination between commodities having a similar use, a reasonable opportunity to mix homogenous things should be given, and then these primary groups should be collected into a limited number of general rating groups, substantially in accordance with the stage of processing reached in the transition from rough materials to luxuries or accessories. Each of the general rating groups and such of the primary groups as require it, should be separately rated, so that the maximum volume of profitable traffic will be attracted, no traffic be repelled by excessive rates, none handled at an actual loss; and that the aggregate traffic, when weighted by volume, will produce revenues sufficient to make the carrier operations profitable.
>
> There appears to be no need to continue three separate classification rating systems, from either traffic or commercial standpoints. With important exceptions, there is little difference in the revenue results of the three classifications, and there is little, if any, difference in the distribution of the different commodities between the three classification territories.
>
> The process of changing the classifications should be an orderly one. The first and most important step is the determination of the general rating groups and the assignment of commodities to them. As shown by analysis of 1932 revenues, there are a large number of commodities which could be readily aggregated into homogenous groups without disturbing the present relative levels. The others should be treated initially as exceptions and changed as the occasion and demand therefor arises.
>
> Tariff complexity can be reduced and the utility increased by unification of rate systems and publishing authorities, by simplifying commodity classification and by grouping carrier routes into a limited number of definite channels.

### Universal Routing Privilege Condemned

The idea that available routes should be kept to the minimum is repeated throughout the report, and data are advanced in support of the idea that the universal routing privileges now accorded the shippers are highly costly and uneconomical, not only adding enormously to the complexity of tariffs, but also needlessly multiplying the number of interchanges and increasing terminal

delays and costs. The report comments on the situation as follows:

The privilege of specifying the carrier's intermediate, as well as initial and final junction, was conferred on the shipper to protect the small and intermediate carrier in the strife for traffic against its larger and more strongly intrenched competitors, and to place a weapon in the hands of the shipper by which he can enforce good service.

The policy of wide open carrier routes, however, has developed evils which outweigh these conceded benefits. The weapon in the shipper's hands can be, and, increasingly in the past few years has been, used as a club by which to compel carriers to grant rate reductions or adjustments, instead of submitting such demands to the Commission. The practice leads to prolixity and complexity of tariffs to avoid indefiniteness, it encourages circuitous routing and it has greatly increased the necessity, intensity and expense of off-line solicitation. Besides, it increases the number of points at which interchanges are made, increases the number of interchanges and discourages intercarrier train operations, thereby producing inefficient operations.

The benefits of wide open routing to the shipper are illusory. The service by direct competitive routes will generally be far superior to that available by circuitous routes. Competition in service would be no less effective if, for a given movement, there were only three or four direct routes open instead of many thousand routes. With direct routes available, grouped into definite channels, the shipper's interests will be advanced by great acceleration of the overall speed, which results from the movement of intercarrier trains, and also by the elimination of waste in operating expenses which, in the end, are borne by the shipper.

The analysis of movements of all cars which terminated on December 13, 1933, made possible the determination of the average deflection from the direct route of rail shipments. The direct route used in each case was not necessarily the shortest possible distance by rail, but was the shortest of the routes normally or customarily used.

In the United States as a whole, the average car terminating on the above day moved about 11 per cent further than would have been necessary had it moved via the direct route. The greatest degree of circuity, 27 per cent, appeared in shipments originating in the Pacific Northwest and moving to New England.

## Freight Station Operations

A great deal of space is devoted to the consolidation of freight station facilities and work, practically all phases beng analyzed, and a number of conclusions arrived at as to possibilities of improvement. These conclusions are given below:

The straight bill of lading, freight expense bill, and prepay bill should be revised to register with the Railway Accounting Officers' mandatory freight waybill, and the forms should be prepared by the shipper and the carrier in such combinations as will afford the best transportation service.

Rate and revision bureaus operated by the accounting department should be established at principal and pivotal freight stations, transfers and yards; on originating traffic applying rates and extending revenues; on received traffic revising rates and revenues in advance of expense billing; and on passing traffic revising rates and revenue while the cars are at the station.

That the making of waybills and expense bills at principal points be taken over by the accounting department, to avoid loss of time and confusion incident to passing and repassing between departments.

Central or master stations should be designated for the purpose of maintaining complete tariff files concentrating the assembling, running, unloading and distributing of l.c.l. freight and handling the rating, billing, expensing, collecting and other office work, thereby reducing tariff expense, eliminating package car runs, increasing average carloading and promoting efficiency and economy both in office and warehouse operation.

In Metropolitan areas, joint agencies should be created to handle the collection of transportation charges for all railways under uniform rules on what is known as the "Kansas City Plan," also the lifting of order-notify bills of lading, of advise orders, of weight certificates on cars on which outturn weights govern, and the distribution between carriers as needed of bonds filed by patrons as guarantee against delayed or lost bills of lading.

In smaller cities and towns served by two or more carriers, local agents should be organized to supervise the same elements of station service under what is known as the 'Detroit Plan.'

In joint agencies other than the regularly established collection bureaus, the rules of the railroad operating the station should govern the collection of transportation charges on all lines party to the joint agency.

All funds of a joint station should be kept together and remitted to the treasurer of the operating railway, under its rules and regulations, and the tenant line's collections should be remitted to it, as required in its rules, by a station draft from the joint agent, patrons being allowed to make a single check, payable to the joint agent, for a day's business on all the companies party to the agency.

Existing inbound, outbound and transfer stations should be consolidated, and, where practical, new stations with the necessary team tracks should be located adjacent to the main receiving and forwarding yards, on hard-surface roads with good approaches thereto.

Four-wheel trailers should be used in acceptance from and delivery to the public of l.c.l. freight and in 'ferrying' shipments so loaded between main, sub and transfer stations, electric or gas tractors being used to handle them where volume and operating conditions warrant.

Carriers should place arriving merchandise as early as possible, starting the necessary unloading gangs and the inward office force at such hours as will complete unloading of the available cars and have the shipments ready for delivery at the established hour of opening for business.

Studies should be made at important stations from time to time to determine the deliveries made on the day of unloading by the several classes of delivery service, C. & D. and contract drayages to be based on actual deliveries to the patrons.

Receivers should be urged to accord traffic arriving by rail an equality of treatment with that handled by highway vehicles.

Freight should be handled with two-wheel trucks, and the so-called 'drop truck' system should be used. A clerk and two truckers should be considered a gang unit, with the clerk loading trucks, and the truckers trucking and stowing freight; this formation to be deviated from only in specific cases when made necessary by the character of the freight handled or other conditions which warrant it, in the opinion of the foreman.

Constant study should be made by individual carriers to improve station facilities and methods, keeping them in line with or in advance of competing forms of transportation, reporting to the American Association of Railroads, for the benefit of the carriers generally, any new ideas and practices found to be efficient and economical.

Railroads should co-operate to provide a maximum number of points at which patrons may receive and deliver their shipments.

L.c.l. merchandise transferred between stations of railways at junction points should be handled by highway vehicles.

The three territorial ratings now carried in the Consolidated Freight Classification should be reduced to one, to apply on both intrastate and interstate traffic, and the number of classes on l.c.l. should be reduced and the description of the articles simplified.

Packing requirements and tariffs should be simplified and class and l.c.l. commodity rates should be amended so that there will be no necessity for alternate application.

Regulations governing the filling of tariffs should be amended to permit each carrier party to a joint agency to supply only its own local tariffs, the railroad operating the station to supply, without duplication, the railroad and agency tariffs necessary for the proper operation of the station, dividing the expense thereof on an equitable basis.

Records should be maintained at important stations showing the office and warehouse separately, and man hours, wages, overtime, unit costs, man hour production for the day and accumulated for the month, by classes of employees. This should be compared with the same data for the previous year and copies should be sent daily to the superintendent and station supervisory officers.

Insofar as practical, demurrage records and reports should be made at one writing, with carbon copies, and, where this cannot be done, only cars on which demurrage accrues should be transcribed to reports made by agents.

Interline switching statements should be used as the basis for

settling terminal per diem reclaims, and the agent of the road delivering the cars in interchange should prepare a summary showing the number of cars on which each line is entitled to a reclaim, supplying the receiving line with the necessary copies.

Transited traffic should be billed from the transit point to the destination at the balance of the through rate; tariffs being changed accordingly, where necessary.

Interline waybills should be printed by all carriers with such a number of additional parts as are necesary to meet the need at junctions on traffic moving over the average number of roads.

Each railway, after careful study of the kind and volume of work done at its stations, should establish a rank or grade for each station, and devise means for examining employees seeking promotion to agents or other key station positions, awarding to the successful applicants certificates showing the grade of station and the title of the position to which they are eligible, and the position to be awarded to the senior employee applying who holds the proper certificate.

The railway should study the practicability of a light, flexible, mechanical carrier, preferably electrical, as a substitute for messengers, automobiles or pneumatic tubes.

In addition to the three volumes of summaries thus far issued as part of the freight traffic report, the statistics themselves, from which the comments are derived and by which they are presumably fortified, will be issued in the form of supplements at a later date.

### Effect on Labor

Naturally many of the co-ordinating arrangements suggested will affect railway labor. The Co-ordinator, therefore, comments along these lines.

No class of persons, he says, has felt the effect of the breakdown of the industry more seriously than has labor. In 1920, over ten per cent of the population of the nation depended directly or indirectly upon railway employment. Today, it has shrunk to less than half that amount. The reduction in total yearly earnings, particularly among unskilled employees, has been relatively higher than in many other industries. Because of constant progress and new facilities, it is possible that much of the personnel in the industry may be reassigned permanently. In many of the suggestions designed to effect economy, made herein, the employees, if not protected by appropriate provision, would initially bear the brunt. Adequate steps to avoid that end should be taken.

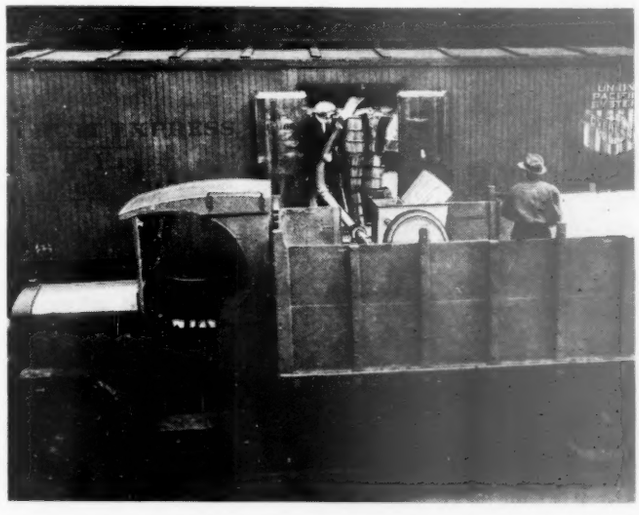
Much more important to labor, however, is that stability and security of transportation employment be re-established and maintained. No real or lasting benefit can be attained by the industry which will not be reflected immediately in an improvement of labor conditions. On the other hand, no law or rule, however stringent, will permanently protect against the inevitable collapse of an unprofitable industry. The greatest opportunity for the employees lies in the rehabilitation of the industry itself. When the industry is prostrate, the employees will naturally suffer. When the industry is prosperous, the employees inevitably must prosper.

# Top-Icing Refrigerator Cars with Snow Ice

FOR years it has been the custom to use block ice for re-icing shipments of certain vegetables, a process that often resulted in the breakage of a considerable number of the crates. Finally the idea was conceived of using motor-driven machines, mounted on light trucks for movement to car doors, that pulverized blocks of ice and blew the particles into the car through a hose.

The top-icing of refrigerator cars loaded with green vegetables by using snow ice provides moisture and refrigeration to insure arrival of the produce in an attractive condition, thereby commanding the highest market prices. It is suitable for use with all such green vegetables as cabbage, celery, corn, lettuce, peas, beans, spinach, beets, carrots, cauliflower, broccoli, endive and parsley.

To meet the demand for suitable mechanism for providing and handling powdered ice in top icing refrigerator cars the Link Belt Company, Chicago, Ill., has developed a line of machines for this purpose. In one form the machinery is mounted on a truck so that it can be moved from yard to yard and from car to car with speed and efficiency. The equipment includes an ice crusher or slicer which is operated by either a separate gasoline motor, an electric motor, a power take-off from the truck engine or from the rear truck wheels. A full-sized cake of ice is first divided into four sections. A quarter block is then thrown into a hopper and the slicer pulverizes it. The powdered ice is then forced by a powerful blower or ice slinger through a large rubber hose about 6 in. in diameter, which is passed through the doorway of the car. On the end of the hose there is a patented cup-shaped sprayer which sprays a blanket of snow ice evenly over the car or wherever it is directed. As this ice is ground up to the finest of snow, the contents of the car when top-iced are covered with a uniform layer of ice snow. This ice shifts down between the crates, giving complete refrigeration to the entire carload, prevents center heating, renders bunker icing unnecessary and in addition reduces the danger of breakage of the packages by rough handling as the packages are held firmly in place by the ice particles. Furthermore, the high speed blast of ice forces out all warm air, and thus pre-cools the car. Slinger-iced cars have crossed the continent without re-icing. The ease with which a car is top-iced by this system is noticeable. The operator spraying the snow ice over the top of the load



Re-icing Car of Green Peas in Philadelphia with a Link-Belt No. 6 Combined Crusher and Ice Slinger Mounted on a Truck

can stand in the doorway and reach both ends of the car without moving. It is not necessary that he climb into the car thereby breaking packages or disturbing the load.

The line of snow ice crushers and slingers thus far developed by the Link Belt Company includes six different forms or combinations, most of them portable, thus making available different equipment to meet varying conditions at railroad yards or shipping points where re-icing is done. Companies have already been organized, are equipped and are already attending to the re-icing of refrigerator cars by this method at Chicago, Philadelphia and other points.

# Congress Enacts Pension Tax Bill

## Finally amended to require equal contributions by carriers and employees for one year

A TAX bill intended to produce funds for the first year of the operation of the railroad pension plan provided for in the bill passed by Congress earlier in the week, unless Congress changes the pension plan before it becomes effective as a result of the investigation to be made by a special commission, was passed by the House on August 22 and by the Senate on August 23, without discussion. The bill passed was that proposed by the Railway Labor Executives' Association and introduced in the House by Representative Crosser, of Ohio, as H.R. 8652, but with amendments adopted by the House ways and Means Committee on August 22 providing for a tax rate of 3½ per cent to be paid by the railroads, the express companies and the Pullman Company, and of 3½ per cent to be paid by the employees, on their compensation (excluding that over $300 a month). These rates, making a total of 7 per cent, were adopted by the committee after three days of hearings on the bill and after consultation with the President, in place of the rates proposed in the bill as introduced of 4 per cent to be paid by the employers and 2 per cent by the employees. A tax of 7 per cent is to be paid by representatives of railroad labor organizations authorized to represent railroad employees, who have been in the service of a carrier.

### 6 Per Cent Insufficient

The amount of taxation proposed in the bill was increased after representations had been made to the committee that 6 per cent on the railroad payroll would be inadequate to support the pensions provided for in the separate pension bill, although proponents of the bill had contended that it would be sufficient to meet the payments in the earlier years of the plan, but because the pension bill carries a provision for an investigation of the entire subject by a special commission which is to report to the President and Congress by January 1, a provision was inserted limiting the tax feature to the period from March 1, 1936, when the pension plan becomes effective, until February 28, 1937. Another amendment exempted railroad service from the provisions of the social security act, which had proposed a tax of 3 per cent on employers and 3 per cent on employees. The pension bill had included a provision exempting railroad employees from the pension benefits of the social security act but not from the tax provisions of that law.

### Tax on Railroads Estimated at $52,500,000

The tax would amount to about $52,500,000 for the railroads, $10,500,000 for the other carriers, and about $63,000,000 for the employees.

In the rush to bring about an adjournment of Congress by the end of the week, the tax bill was passed by the House on August 22 without a word of debate or discussion in the form in which it had been reported earlier in the day from the ways and means committee by a vote of 18 to 4, after consultation with the White House. It was reported that the President had sent word that he wanted the bill passed but that he did not want to approve the pension bill without provision for providing the money through a tax bill.

The House bill was then reported favorably by the Senate Committee after hearings on the following day, by a vote of 12 to 1, and was passed by the Senate without discussion.

### Hearings Before Four Committees

Because of the theory on which the plan was presented by the railroad labor organizations hearings were required before four separate committees, and, although an effort was made by the proponents of the bills to keep them as separate as if they had no relation to each other, it was necessary to go over before the House ways and means committee and the Senate finance committee much of the ground relating to the pension bill which had been covered at previous hearings before subcommittees of the Senate interstate commerce committee and the House committee on interstate and foreign commerce. Before the Senate finance committee on August 22 and 23 testimony in support of the tax bill was given by Timothy Shea, chairman of the legislative committee of the Railway Labor Executives' Association, E. A. Krauthoff, counsel for the labor executives and author of the Wagner-Crosser bills, H. L. Ekern, counsel for the Railroad Employees' National Pension Association, R. V. Fletcher, general counsel of the Association of American Railroads, C. A. Miller, general counsel of the American Short Line Railroad Association, and Murray Latimer, chairman of the Railroad Retirement Board.

In reply to assertions that the rates of taxation proposed were inadequate Mr. Ekern said that the estimates were based on the present payroll and that on the basis of the average for the period 1920 to 1933 they would produce $165,000,000 a year. Replying to this later Judge Fletcher said that if the railroad business and payroll increased the cost of the pension system would also be increased by the addition of younger men who have been laid off or furloughed.

### Railroad Employees Regarded as Favored Class

Chairman Harrison of the committee asked why the bill proposed to tax the railroads twice as much as the employees, pointing out that the social security act proposed to tax them alike. He said there was a question in the minds of a great many people as to why there should be this discrimination between railroad employees and others. Mr. Ekern replied that railroad employees have always been accorded separate treatment and that it is a fundamental principle of every contributory pension system that the cost for the future should be borne equally but that the employers should pay the cost resulting from prior service. He said, however, that Congress would have power to change the percentage rates at any time.

After the House had passed the bill with provision for a tax of 3½ per cent on employers and 3½ per cent also on employees, he said the proponents of the bill would not object to that for one year, because the matter is to be investigated by a commission, but that a total

rate of 7 per cent ought to take care of the annuity payments for 14 years and that the railroads ought to pay a larger proportion to cover the prior service. When Senator Bailey, of North Carolina, asked if the railroad employees were willing to have it said that they had asked to be treated as a favored class, Mr. Ekern and Representative Crosser replied in the affirmative. While Mr. Krauthoff had sought to justify the bill as constitutional under the taxing and spending powers of Congress, Mr. Ekern said that he took the position that it was sound also as a regulation of interstate commerce, on the ground that it would benefit the condition of the railroads to be able to retire their older men.

Senator Bailey asked if it is not necessary to take the position that the bill proposes to levy a special tax on railroad employees for the purpose of paying them special retirement annuities, saying: "We can't kid ourselves; we can't kid the Supreme Court, and we can't kid the railroad employees. Don't you think the court will look all the way through these acts and see what we have seen this morning?" Mr. Krauthoff undertook to reply, saying that he had written the bills and that of course they were related, but that "as a legal proposition they are not so inter-related that one is dependent upon the other."

Mr. Latimer told the committee that as a year-to-year matter the tax proposed would be adequate in the earlier years but that the benefit payments would increase from year to year. He said that on one theory a level rate could be imposed that would leave a surplus in the Treasury for earlier years to take care of the greater payments in later years but that on another theory it might be better to assess a relatively low rate at the start and gradually increase it after ten or twelve years to a constant figure. It is conceded, he said, that the tax rates proposed in the bill would have to be raised after about ten years and that he had told the House committee that 7 per cent would not be adequate as a level rate to continue but that it ought to be at least 10 per cent. However, he said, this was not approved by either side. He offered a suggestion, although he said that perhaps it was too late, that the railroads and their employees be left subject to the social security act so far as it goes and that additional taxes be assessed through a separate bill to cover the expense of the diffrence between the annuities provided for in the general law and those in the special railroad pension bill. He suggested that the exact rates and the method of co-ordinating the two plans be left to the investigating committee.

### Undue Haste with Billions Involved

Judge Fletcher told the committee that this additional suggestion indicated the confusion which surrounds the whole subject, just as the action of the House committee the day before was a confession of inability to reach a sound conclusion, and he protested against legislation at this time before there has been adequate expert consideration of the subject such as might be afforded by the investigation of the special commission. The social security act, he said, treats everybody alike, while the railroad bills propose to subject the railroads to some more "weird experimentation." As to the cost he quoted from Co-ordinator Eastman's letter in which he said that the plan starts off with an "initial deficit" of $3,700,000,000 for prior service. Mr. Latimer said that that estimate was based on the old law and that under the new bill it would be $2,800,000,000, but that it would be taken care of from the tax rates proposed for the future and was not a cash deficit.

Judge Fletcher said he did not think the railroads should be exempted from the social security act if it is to be applied generally but that his objection was to making the railroad employees a favored class at the expense of an industry that "is in the red." When Senator La Follette asked if the social security act would not be subject to the same constitutional objections he had offered to the railroad bill, Judge Fletcher said it would not be to the same extent because it does not arbitrarily pick out one class of employees to be favored as compared with others.

At the conclusion of the hearing Mr. Krauthoff urged the committee to adopt the House bill as passed, because to make any changes now, such as that suggested by Mr. Latimer, would throw the whole subject into conference and cause delay. He said the 7 per cent tax rate would more than carry the system for one year.

Mr. Krauthoff had emphasized that in addition to the prospect of a pension each employee who pays the tax would get a benefit in the prospect of promotion as the men ahead of him are retired or moved up under the seniority system. He attempted to justify the bill under a broad construction of the Constitution which, he said, made Congress "almost omnipotent." If it was not, he said, there was no foundation for many of the bills it has been passing.

### Basis of Railroads' Opposition

Judge Fletcher in his statement before the Senate committee said in part:

It may be said that this legislation is attempted under the taxing power of Congress and not under the commerce power. It will be seen, however, that this question goes far beyond the question of the right to regulate commerce or what may be done by Congress in the process of regulation. It is a definite finding by the court that the right to accomplish a social end of this character is one which is reserved in the Constitution to the states or to the people under the express terms of the tenth amendment. In other words, this legislation goes to the very heart of our federal system and involves the important question of whether an end of this kind can be accomplished under the plan which reserves to the states and the people the residuum power and delegates only a limited authority to the federal government. In addition to this general consideration, the court held that the former act violated the fifth amendment in three or four important particulars. It was held that it was a denial of due process to award compensation based on past service which had no relation to commerce. This objectionable feature is retained in the bill which has passed the Congress. In the second place, it was held that it was a violation of due process to pool the service of an employee upon all railroads of the country. This objectionable feature is retained in the present bill. It is said, however, that the present plan will withstand attack because it is divided into two parts, one which pays the retirement allowances out of the Treasury of the United States, and the other, which levies excise and income taxes upon the employer and employee to reimburse the Treasury. I submit that Congress cannot be endowed with power in a non-federal field by so crude and simple an expedient.

If it be said that it is the function of the committee to consider the revenue measure, S. 3150, and that it need not concern itself with the pension bill which Congress has passed, I respectfully submit that Congress may not constitutionally select one industry and subject it to a heavy tax not laid upon industry generally. The effect of this bill, if it becomes a law, is to place a tax upon an industry, measured by 4 per cent of the payroll, and a tax upon employees, which is 2 per cent of their compensation up to $300. While the power of Congress to levy taxes is very broad, it is not unlimited. Cases which I could readily cite to the committee if time permitted hold that the legislature may not act arbitrarily or capriciously in the selection of objects of taxation.

Aside from the legal question involved, which I have not time to discuss, I appeal to the committee on the ground of common justice not to lay this burden upon the railroad industry, just now sorely pressed, while at the same time their competitors in the field of transportation are not similarly burdened. I

think I am safe in saying that 17 per cent of the traffic of the country is moving on the highways. It is well known that truck traffic has been increasing by leaps and bounds until it is now an active and formidable competitor of the railroads in the field of transportation. Under the recently enacted law truck transport is subject to the Interstate Commerce Commission in the matter of grants of certificates of convenience and necessity and with respect to the supervision of its rates. No good reason has been given or can be given why the railroad industry should be selected for this discriminatory treatment while its competitors on the highways, on the waterways and in the air are not subjected to the same burden. No one has attempted to answer this argument and no one can.

Furthermore, I call attention to the precedent which will be established if legislation of this kind is approved. I know of no sound reason why one particular industry should be selected for special treatment of this kind. You will recall that the social security act, which has become the law ot the land, was passed upon the theory that all employers and employees should be treated alike, and the benefits provided for in that act, and the taxes levied by that act, apply to all forms of industry without discrimination. No one has given a reason, or can give a reason, why the railroads should be burdened more heavily than other forms of industry, or why railroad employees should be selected for exceptionally favorable treatment. In this connection I call attention to what was said by the Federal Co-ordinator of Transportation in his letter to the chairman of the Senate committee on interstate commerce, in which he pointed out the difficulties which would arise in the administration of the social security act by reason of the exceptional treatment accorded to railroad employees. I call attention to this significant language in Mr. Eastman's statement:

> Unless this is done, Congress, by setting up a pension system for a special class of employees such as those of the railroads, inadequately articulated with the old age benefit features of the social security bill, may well start in motion the process of establishing similar pension systems for other special classes of employees, thereby undermining the financial foundations upon which the present social security bill rests.

This is a significant warning. If this Congress passes a law taking railroad employees out of the general class covered by the social security act, we may expect other classes of employees to demand similar exceptional treatment. It is the railroad employees this year; it may be the coal miners next year; it may the the steel workers the year after.

It is admitted that the pension bill which has passed Congress is in such form and calls for such large payments as that the taxes provided in the current bill will be totally inadequate to bear the expense. According to Mr. Latimer's best estimates of the railroad payrolls in the amount of tax on payrolls required to meet his estimated disbursements in those years would be 15.3 per cent. Suffice it to say that we are convinced the figures given in Mr. Latimer's estimate should be plussed to such an extent as to make us say with confidence that the cost will not be 15 per cent of the payroll but more nearly 18 per cent of the payroll! We see, then, that Congress is confronted with a serious question as to where the money is to come from to pay these liberal pensions. Either it must fall upon the industry or the deficits must be taken care of out ot the public treasury. Since the Class I railroads in 1934 lacked $32,000,000 in paying their fixed charges, and since we now have approximately 60,000 miles of railroad out of 240,000 either in receivership or in bankruptcy, it must be clear that the industry cannot bear this constantly mounting expense which in two decades will consume 18 per cent of the payrolls. Such a course if continued will inevitably lead to the imposition ot burdens which the industry cannot possibly bear. The alternative is to subsidize this special class of employees out of the federal treasury and thereby establish a precedent which will be difficult to escape and which is contrary to all of our theories ot government.

The Committee will remember that in the bill which has already passed it is provided that a commission shall be appointed, consisting of 3 Senators, 3 Representatives, and 3 persons to be appointed by the President, to study this question of railroad retirement and make a recommendation to Congress. The legislation as it stands now excludes railroad employees from the benefits of the social security act but leaves the industry subject to the tax imposed by Title VIII of that act. It is clear from the statements of the informed chairman of the Railroad Retirement Board that the tax proposed in this bill will not be adequate to take care of the costs which the pension act imposes. No good reason can be given why Congress, at this time in the hurry of the closing days of the session, should give its sanction to a taxing plan which is admittedly inadequate in advance of the recommendation which will be made by the commission two months before the pension bill becomes effective. It would be just as well to leave the legislative situation as it is until the matter can be carefully studied, remembering that there will be two months of the next session before the pension bill goes into effect.

C. A. Miller told the committee that if the bill is enacted into law, and sustained by the Supreme Court of the United States, there would be placed upon the members of his association alone an additional financial burden of approximately $1,050,000 per annum. The additional financial burden imposed upon the short lines would be approximately $1,312,500 per annum and this additional cost of operation would result in about 67 per cent of the short lines failing to earn operating expenses and taxes, and about 80 per cent of them failing to earn their fixed charges.

"It is our view," he said, "that Congress puts the cart before the horse if it enacts either H. R. 8651 or H. R. 8652. We believe the proper procedure would be to pass House Joint Resolution 314, for a thorough study made of the whole subject, and then enact such legislation as may be desirable, if any be such."

* * *

Courtesy: German Tourist Info. Office, N. Y.

Cable Suspension Railway to the Top of Zugspitze, Highest Mountain Peak in Germany

# Can the Iron Horse Maintain His Stride?*

## Steam locomotives with relatively low initial, operating and maintenance costs can be built to meet all requirements of speed and capacity

**By Frank Russell**
Mechanical Engineer, Southern Pacific

THE development of the locomotive can be divided into four periods of about 30 years each.

First period: Construction and development covering the years 1829 to 1860. During this period the greatest single achievement was the invention of the swiveling truck, which made possible traveling at high speeds. During this period boiler pressures ranged between 120 and 130 lb. per sq. in.

Second period: Extension and development covering from about 1860 to 1890. There were many great achievements during this period, the most important of which was the invention in 1868 of the Westinghouse straight air brake, followed by the plain automatic air brake in 1872 and the quick action in 1887. The automatic coupler was developed during the early eighties. These inventions made traveling at high speeds safer and permitted handling much longer and heavier trains, paving the way for more powerful locomotives. Boiler pressures during this period ranged from 125 to 180 lb. per sq. in.

Third period: Improvement in design from 1890 to about 1920. The greatest achievements of this period were the development of the superheater, feedwater heater, piston valves, improved valve gears, outside steam pipes, wide firebox and general improvement in boiler design. Boiler pressures during this period ranged from 180 to 220 lb. per sq. in. Steam temperatures ranged from 450 to 650 deg. F.

The following are a few examples of the speeds obtained with locomotives developed during this period: 1893: In this year, long before superheated steam was used, the "Empire State Express" on the New York Central made 5 miles at a speed of 104 m.p.h. and one mile at a speed of 112.5 m.p.h.

1901: Between Fleming and Jacksonville, on the Plant System, a distance of 5 miles was made at a speed of 120 m.p.h.

### 115 Miles Per Hour in 1904

1904: A Philadelphia & Reading train, made 4.8 miles at the rate of 115.2 m.p.h. Between Camden and Atlantic City, the Pennsylvania with a 4-4-0 type locomotive, attained speeds of 106 m.p.h.

1904: In England, on the Great Western, a train between Paddington and Bristol, a distance of 118.5 miles, traveled at the rate of 84.6 m.p.h.

1905: From Chicago to New York via the Lake Shore and New York Central, 960.5 miles was made in 15.56 hours, an average speed of 60.28 m.p.h. From Buffalo to Chicago via the Lake Shore, 525 miles was made in 7 hrs. and 50 min., an average speed of 69.69 m.p.h.

1906: The Pennsylvania re-christened the old "Pennsylvania Special," 18-hour train between Chicago and New York, the "Broadway Limited." This train established a record at pulling into the Union Station, Chicago, on time 362 mornings out of 365, or 99.2 per cent performance—making a similar record eastbound, a remarkable record for reliability.

Fourth period, beginning in 1920: The super-power locomotive is now a reality and I might add the super-speed locomotive. As this period carries us on to 1950, we have much to anticipate during the next 15 years.

### Motive Power Now Available

We now have as motive power steam, electric, and Diesel-electric locomotives, not overlooking the airplane for extremely high-speed service. All classes of power thus far developed have their field of usefulness or superiority and no one has a monopoly on all.

The electric locomotive has some distinctive advantages in congested areas where traffic is fairly dense and uniform. It also has some disadvantages such as high initial cost in itself and the roadway and equipment necessary to its operation—all of which must be provided of sufficient capacity to accommodate the peak load. This runs up the expense of fixed charges to such an extent as to offset much economy and makes electric power too expensive for general adoption. At present 2,400 miles out of about 250,000 miles of railroad are electrified.

At costs obtaining the first of this year modern steam locomotives could be built at about $29 per horsepower, electric locomotives about $75 per horsepower and Diesel-electric locomotives about $100 per horsepower. Fixed charges with the Diesel-electric will be extremely high but should be offset considerably by fuel economy.

The Diesel engine has no starting power and must be operated at fairly uniform speed for maximum efficiency. It is, therefore, necessary to provide some form of transmission to apply the power delivered by the engine. The most satisfactory method thus far developed is electrical. It is, however, only about 80 per cent efficient at the more favorable power output conditions and losses may run as high as 40 to 50 per cent under unfavorable conditions.

### Streamlining

Streamlining has been much before the public's eye of late, yet it is not new. In 1900 tests were made on the Baltimore & Ohio with locomotives Nos. 822 and 854 in combination with a train of five cars, the so-called "Wind-splitter," which was built at Mt. Claire shops for the purpose of demonstrating the increase in train speed that could be obtained by minimizing the resistance of air pressure. The train was vestibuled to the outside of the cars from end to end and the sides extended to within a few inches of the track. The tender

* Abstract of a paper presented before a meeting of the Pacific Railway Club, May 9, 1935. Much material relating to the Diesel engine and to trains propelled by such engines has been omitted.

was made flush with the tops and sides of the head-end car and the last car had the sides tapered to the rear end. It is reported this train made a trip between Philadelphia and Baltimore, 97 miles, in 101 minutes. The practice was discontinued, however.

The benefits of streamlining are of little effect at speeds below 50 m.p.h. The following comparison of resistances will illustrate this point:

### Head-End Air Resistance Not Great

Considering a 4-6-4 type locomotive hauling 12 Pullman cars, averaging about 75 tons each, making the total weight of cars about 900 tons, the rolling resistance, including locomotive machine friction, at 60 m.p.h., is about 6,100 lb., whether operating on level or grade. Wheel flange resistance will be about 2,200 lb. regardless of grade, and the so-called head-end air resistance of the locomotive 864 lb., regardless of grade. Total air resistance of locomotive and train is 2,700 lb.; grade resistance on the level, nothing; on a .5 per cent grade, 11,270 lb., and on a 1 per cent grade, 22,540 lb.—thus we have a total resistance on level track of 11,000 lb., on a .5 per cent grade of 22,270 lb., and on a 1 per cent grade of 33,540 lb. The headon resistance of a locomotive in percentage of total is, on level track, about 7.86 per cent, on a .5 per cent grade only 3.9 per cent and on a 1 per cent grade only 2.6 per cent.

Head-end air resistance is thus comparatively small as compared with the total resistance, even if it could be entirely eliminated. Consequently, there appears to be little to be gained from fully streamlining the locomotive itself, which would interfere with inspection and increase cost of maintenance and repairs. Furthermore, it is a well-known fact that a quartering or broadside wind creates air resistance and streamlining the locomotive affords little relief. It would appear that the major portion of reduction in air resistance can be accomplished by smoothing up the outside surface of equipment in the train and by tapering off the rear car to reduce suction. The relief that can be obtained by reduction in weight of equipment far outweighs that to be obtained from streamlining.

### Foreign Locomotives

In Germany—the home of the Diesel and the "Flying Hamburger"—during the past two years engineers have concluded that the steam locomotive is capable of development for speeds and loads meeting all requirements for many years to come. Nor do they consider it requires the use of extra high pressure, turbine, special fuels or other special locomotives designed primarily to improve thermal economy, involving more or less radical designs.

Both Prof. Nordman and Dr. Litz pay special tribute to the performance of steam locomotives in Germany and emphasize the predominant position of this type of motive power by showing that steam locomotives represent about 91 per cent of all locomotives in use—steam locomotives of all German railways, 22,300; electric, 640; rail cars, 1,450. Locomotives of the 4-6-2 type have sustained an average speed of 87 m.p.h. and reached a maximum of 95 m.p.h. on the Berlin-Hamburg line and have exceeded the 77.4 m.p.h, start to stop, practically the schedule of the "Flying Hamburger." There is at present a concentration of interest in Germany on the development of steam locomotives for high speed without appreciable sacrifice of hauling capacity. Present loads and speeds in Germany are approximately as follows: Express trains—350-500 tons; speed, 75 m.p.h. Stopping passenger trains—500-600 tons; speed, 62 m.p.h. Good trains—1,000-1,200 tons; speed 43.5 m.p.h.

In England we find a similar confidence in the steam locomotive. The "Flying Scotsman," between London and Newcastle, covers the distance at an average speed of 52 m.p.h. with a train having a capacity for 400 passengers and weighing 350 to 450 tons. The London & North Eastern made a study to check its previously-determined theory which holds that under prevailing conditions "Better results can at present be obtained from the use of light units drawn by steam locomotives than by Diesel-engined trains." The L. & N. E., however, decided to check the theory further and after picking a stretch of track which contained a few difficult grades and sharp curves, for approximately the same distance as found on the route of the "Flying Hamburger," it submitted to the manufacturer of the German train's engine, diagrams and profiles and invited the manufacturer to submit speed schedules which a similar Diesel-propelled train could be expected to achieve when operating over such lines. The manufacturer estimated that such a train should make the 268 miles of the London-Newcastle run in 252 min., or an average speed of 67.05 m.p.h.

### 108 Miles Per Hour in Britain

To determine more accurately what could be accomplished with light, steam-propelled trains, on March 5 the L. & N. E., London to Newcastle and return, with a 213-ton train, attained a speed of 108 m.p.h., which is the fastest speed recorded for a steam-driven train in that country. We also learn that 240 miles were covered at an average speed of 80 m.p.h. and that the train set up another record when it traveled 12 miles at an average speed of more than 100 m.p.h.

The train—consisting of three first-class coaches, a dining car, a brake van and a dynamometer car—was hauled by a Pacific type locomotive which was built in 1928 and had already run 392,852 miles on its ordinary passenger train assignments and was not especially prepared for this run.

### Recent Developments in this Country

During the latter part of 1934 the C. & N. W. remodeled four Pacific type locomotives, Class E-2, at a cost of about $14,000 per locomotive. The reconditioned locomotive is the conventional design with cylinders 25 in. by 28 in., 210 lb. boiler pressure and developing a tractive force of 45,800 lb. The principal changes in this locomotive were the increase in boiler pressure to 225 lb., increase in diameter of drives from 75 in. to 79 in. and change in fuel from coal to oil. This was to increase the speed of the "400" train between Chicago and St. Paul, which was so named because it made the distance of over 400 miles between Chicago and St. Paul in slightly over 400 minutes.

On account of the success with this train the running time has since been reduced from seven hours to six and one-half hours. With this schedule the run from Chicago to Milwaukee is made at the rate of 68 m.p.h. and between Milwaukee and St. Paul the average speed of 63 m.p.h. Between Highland Park, (Ill.) and Indiana Hill, a distance of eight miles, a speed of 96 m.p.h. has been obtained.

### Ton-Mile-Hour Capacity Now the Goal

I feel that the steam locomotive will take the challenge of the oil-electric as it took the challenge of the electric and will continue to rule the rails, so far as main line freight and passenger service is concerned.

More attention has been given recently to increasing the horsepower capacity of locomotives at high speed than tractive force at low speed; in other words, instead of striving for more ton-miles capacity we are striving for more ton-mile-hour capacity, combined with fuel economy—with the result that we have in service in this country passenger locomotives developing over 4,000 hp. and freight locomotives of over 5,000 hp.

The lengths of runs have been increased from 100 to 150 miles to 500 or 800 miles, resulting in the mileage obtained from a high-speed locomotive being increased from about 60,000 to from 120,000 to 150,000 miles per year. These locomotives go 300,000 miles or over before requiring Class 2 or 3 repairs. Some of the important improvements are: Improved design and materials, improved guiding trucks, application of superheaters and feedwater heaters, application of thermic syphons and brick arches and improved water supply and shop practices.

### Experience Now Available for Major Development in Super-Speed Locomotives

The stage is all set for a major contribution to railroading by applying accumulated findings to the development of the super-speed steam locomotive. The Lima Locomotive Works delivered to the B. & M. a high-speed locomotive which should give a good account of itself. The American Locomotive Company has built a streamlined locomotive for the C. M. St. P. & P.—designed especially for high speed. It will haul a train of light-weight cars weighing about 60 per cent of present equipment with space and comfort the same as in conventional cars. This locomotive is of the 4-4-2, or Atlantic, type with cylinders 19 in. by 28 in. Drivers are 84 in. and the boiler pressure 300 lb. Tractive force is about 30,700 lb. and sustained horsepower of 3,000. Its smooth operating speed is 100 m.p.h. and its top speed 120 m.p.h.

The B. & O. has built two special high-speed locomotives in the Mt. Claire shops. One is called the "Lady Baltimore" and the other the "Lord Baltimore." Neither one is streamlined. These two locomotives are built for 350-lb. boiler pressure, and have Emerson combined fire- and water-tube boilers.

### Three Types of Power in Competition

During the latter part of this year we should see all three types of power in competition for speed and economy of operation. Diesel-electric-articulated and steam will be competing between Chicago and the Twin Cities; electric, diesel-electric and steam between New York, Philadelphia and Washington.

When considering the accomplishments in speed during the third period of locomotive development—1890 to 1920—before the railroads reduced speeds in 1905 to provide greater safety, when boiler pressures ranged from 160 to 200 lb. and previous to the application of superheaters, feedwater heaters, improved materials and improved brake equipment, together with what has been accomplished abroad and in this country with locomotives built eight or ten years ago running successfully at much higher speeds than those for which they were designed—it seems reasonable to believe that with high boiler pressures ranging from 250 to 300 lb. and with superheaters delivering the steam to main cylinders at a temperature ranging from 650 to 750 deg. F., together with feedwater heaters and improved materials, steam locomotives, designed by engineers guided by long years of findings and experience can be built to run successfully and with low overall economy at as great a speed as reasonable safety will permit, with a high degree of reliability and serviceability.

## Appreciating Railroads

Vermonters learned from bitter experience, following the flood of 1927, what it means to be without rail service. Although the railroads did a remarkable job of reconstruction, it was some months before rail service was restored completely. And when it was finally restored, and the first trains went over the line, there was a celebration which rivaled that held when the railroads were first put in operation.

It is said that people never really appreciate their blessings until they are lost. Then the lack of them effectively demonstrates their value.

Vermont was exceedingly fortunate in having its rail lines restored after the flood. Had the State been compelled to rely on its own financial resources to restore them, probably they would not have been reconstructed for some years, if ever.

What Vermont found out about the value of rail service during those days following the flood, the people of a certain section of Iowa and Nebraska have been finding out recently. More than a year and a half ago, the Omaha railroad abandoned its branch line from Sioux City, Iowa, to Wynot, Nebraska, a distance of about 50 miles. The line had been operated at a loss for some time. Because of its proximity to Sioux City, most of the business which it would normally have carried was diverted to trucks.

When the petition for abandonment was presented by the railroad to the Interstate Commerce Commission, that body granted a stay of one year to determine whether or not people living in territory tributary to the line wanted railroad service or not. Apparently they were not interested, so, at the end of the year, the I. C. C. granted the petition of the railroad and the tracks were torn up.

Truckers assured the townspeople and farmers that their transportation needs would be taken care of, pointing out that the bulk of the transportation service was already in their hands and that they could easily handle what little remained.

Here is what happened. The grain rate by rail to Sioux City and the East was three cents per hundred from the farthest point on the line. Now the rate is ten cents a bushel to Sioux City. Coal was laid down in the furthest town for twenty cents a ton. At present truckers are offering to deliver coal to close-in points at two dollars a ton.

Farm values have depreciated from 50 to 75 per cent. Some farmers are 50 miles from a railroad. Homes in the towns erected at a cost of $4000 are begging for buyers at levels as low as $500 and there are no buyers.

Lastly, the Omaha road paid $28,000 each year in taxes, and this sum has been shifted over to the remaining taxpayers.

Certainly this is not a pretty picture, but it is a picture which will be seen in many parts of the United States if rail lines are driven out of the picture. The railroads have been getting some bitter treatment during the past few years, because of government policies, competition from other forms of transportation and, what is more important, the indifference of the people whom they serve.

Let us hope that the people throughout the United States will awaken in time to the value of railroads, before many sections are cut off from rail service.

*—From the Burlington (Vt.) Free Press*

# Odds and Ends . . .

### Robins

An added reason for safe operation on the St. Louis division of the Illinois Central this spring was the nesting of a family of robins in the derrick of the wrecker stationed at Carbondale, Ill. A sign was posted to protect the three small birds and there was some question about the availability of the wrecker in case of trouble.

### Official Family

The executives of the Mississippi & Skuna Valley certainly seem to deserve the term "one big family." E. L. Bruce, Sr., is chairman of the board, R. G. Bruce is president, while C. A. Bruce, F. E. Bruce and E. L. Bruce, Jr., are all vice-presidents. The railroad, incidentally, operates between Bruce Junction, Miss., and Bruce, a distance of 21 miles.

### Unusual Strike

Two thousand Rumanian war veterans decided recently to go on a hunger strike until the government grants their demands for a bonus in the form of free railway passes. Their attempt to insure 100 per cent effectiveness of the strike by remaining together in a meeting hall, however, was frustrated by police who dispersed them.

### Anniversaries

Edward Scheer, vice-president in charge of operation and maintenance of the Reading and the Central of New Jersey, was tendered a dinner in Philadelphia recently by his associates in those companies. The occasion marked the anniversary of three outstanding events in Mr. Scheer's career, it being his birthday, his wedding anniversary and the anniversary of his coming with the Reading.

### Needless Service, But Service Nonetheless

A British stationmaster, upon receipt of a car labeled "Fish" consigned to a firm in his city, remembered that such cars have to be kept in motion to pump air into the tanks to keep the fish from dying, and had the car switched back and forth periodically for 24 hr. When the owner came to claim the shipment, he thanked the stationmaster for his alertness, even though the switching had been unnecessary; the fish were canned sardines.

### Splitting Seconds

The New Haven's "Comet" is operating on a schedule between Boston, Mass., and Providence, R. I., which shows the hour, minute and second the train is due to depart from and arrive at stations, as well as the exact mileage. For instance, the 8:30 train out of Boston is due at Sharon Heights, 19.46 miles distant, at 8:49:01.

### Sacred Thievery

Milestones are worshipped by the Hindoos of India, who used to steal them regularly from the Central Indian Railway's right of way for use in their temple. A Brahmin finally suggested a remedy. The authorities smeared the milestones with the sacred vermilion which the Hindoos dare not touch. Although the markers are no longer stolen, a procession of pilgrims will frequently approach a particularly large milestone, anoint it with oil and pray to it.

### The Great Civilizer

Exactly 35 years ago, an emaciated party of white men staggered out of a fort at Kumasi, Ashantiland, Africa, to greet the relief column that had come to their rescue. Kumasi, at the time, was one of the world's most dangerous spots for a white man, and a gathering of the warlike Ashanti chiefs there had nearly resulted in wiping out the European colony. Last month, on the occasion of the return of the golden throne to the Ashanti king by the British, another gathering of Ashanti chiefs took place at Kumasi. This time, however, the chiefs came by special trains, riding the cushions; while the piping of locomotive whistles superseded the Ashanti war cries. The railway has civilized the Ashantis.

### Russian Railroading

Every once in a while, news trickles in that indicates that all is not as well as might be in the Bolshevik "Utopia." For example, Lazar Kaganovich, the new commisar of transportation, has just issued some startling figures with regard to the safety (or, rather, the lack thereof) of the Russian railways in 1934. During the year, according to Comrade Kaganovich, there were 62,000 accidents on the Russian rail system. Apart from the hundreds of lives lost and the thousands injured, which features are passed over lightly, the report reveals that 7,000 locomotives and 64,000 cars were destroyed in these accidents. When it is considered that only 19,000 new cars of all sorts were placed in service in Russia last year, the seriousness of the situation becomes apparent. Another year or so like the last one and the Russian railways will be swept clean of rolling stock.

### Interesting Jobs for Railroad Women

Many railroad women employees have earned for themselves interesting jobs, according to the Baltimore & Ohio magazine. In addition to Ellen Raymond, assistant general freight agent of the Green Bay & Western, previously mentioned in this department, Frances Dorothy Allen is interior decorator for the New York Central; Pearl Andrews is in charge of cookery on the New Haven dining cars; Dr. Catherine Lankford is surgeon for the Pennsylvania; Daryle Heckman is counsel for the Baltimore & Ohio, which also boasts seven women passenger representatives, a woman chief clerk of its law department; and Olive W. Dennis, engineer of service. Jane Ogle is train hostess of the Atlantic Coast Line; Carpenter Kendall is editor-in-chief of the Milwaukee magazine; and Martha Moore edits the Frisco Lines magazine.

### Job-Hunting De Luxe

Wanting to reach Paris to seek a job, Armand Longle, of Lille, in northern France, found it a simple matter to steal a locomotive in the busy railroad yards outside that city. He set out at full speed for the French capital, 150 miles away. He is now under arrest awaiting a test of his sanity. The quickness and bravery of a station master named Hainaut, at Aulnoye, a few miles from Lille, averted what might have been a serious accident on the busy line of the Nord Railroad. A warning was broadcast when Longle was detected chugging out of the yards. When the locomotive passed, Hainaut risked his life by leaping on board, though the locomotive was traveling 30 miles an hour.

"Where do you think you're going?" he demanded.

"Why, to Paris to look for work," replied the amateur engineer.

Hainaut knocked him down and halted the locomotive, clearing the track a few moments before the passage of a crowded express bound for Valenciennes.

### A Baby's Gold Dollar from General Grant

Once during the Civil War when a troop train stopped for orders at Marriottsville, Md., General Ulysses S. Grant stepped from a coach and accepted a dinner invitation from a railroad train dispatcher. He enjoyed the dinner, then looked about the house. "Haven't you any children?" he asked the dispatcher. "Not yet," was the reply. "Then I want to leave this for your first baby," he said, handing the dispatcher a gold dollar. Shortly afterward, Train Dispatcher Howser and his young wife moved into an old passenger coach, fitted up at one end as a home and the other end as a dispatcher's office. In this they traveled up and down the line wherever the dispatcher was needed most, usually in the thick of the battles. One day while the husband ticked away at his telegraph key and troops outside awaited orders, a baby was born in the other end of the coach and received General Grant's gold dollar. The baby followed in his father's footsteps in due time, became a railroad employee and is now a Baltimore & Ohio city ticket agent at Washington, D. C.

# NEWS

## Long Ties Up Funds for Motor Law Enforcement

### Task of great magnitude—Truck and bus men to have first call on available jobs

An additional appropriation of $1,250,000 for the Interstate Commerce Commission to enable it to carry out the provisions of the motor carrier regulatory act was included in the third deficiency appropriation bill which was filibustered to death by Senator Huey Long as Congress adjourned at midnight on August 26. Opinion was divided as to whether the money could be obtained from another source pending the next session of Congress. Other appropriations in the deficiency bill done to death by the Louisiana Senator were those to finance pensions under the railway retirement act and the various social security acts and to pay the administrative expenses of the Guffey coal law and the Wagner Labor Board.

The President had sent to Congress an estimate of $1,325,000 for administering the highway act, but this was reduced by the House committee. Commissioner Eastman, who has been appointed chairman of the commission's Motor Carrier Division, testified before the House appropriations committee on August 16 that the commission, realizing it would take time to build up an organization, had estimated on the basis of seven-twelfths of the amount necessary for a full year. He also outlined a tentative plan of organization for the commission's Bureau of Motor Carriers, including 632 employees, of which 315 would be in the Washington office, in addition to about 1600 in the commission's present organization.

"The act imposes upon the commission," he said, "new duties which are severe and of large proportions, and we believe that in many ways it will be as difficult a task as the commission ever undertook. In some respects we think it will be more difficult than the regulation of the railroads. Perhaps I can indicate that by giving you our estimate of the number of carriers which will come under the jurisdiction of the commission under the new statute. No one knows exactly what those numbers are, because there have been no comprehensive reports to public authorities. The best information is that which was obtained in connection with the N.R.A. code, and we estimate that there are in the neighborhood of 325,000 common-carrier and contract-carrier trucks engaged in interstate commerce, and something like 200,000 operators of those trucks.

"Then, there are about 700 bus operators. We have very good information in regard to them, and their operations are on a comparatively large scale. Then, under the act, the so-called 'brokers' are subject to regulation, and their number is unknown. Then, under the safety provisions of the act, there are provisions which authorize the commission to fix the qualifications and maximum hours of service of employees, and to prescribe safety regulations. Those apply to privately owned trucks as well as to the common and contract carriers. That will add, we estimate, something like 400,000 trucks when it comes to the matter of safety jurisdiction."

Mr. Eastman furnished to the committee a tentative organization chart showing 16 district offices and six sections in the bureau—certificates, traffic, accounts, formal cases, safety, and legal. He emphasized, however, that the proposed set-up was subject to change, and that there are some differences of opinion to be threshed out as to whether certain phases of the work could or could not be handled to advantage by the use of the existing bureaus of the commission. Even if existing bureaus are used, he said, it would be necessary to have the additional men, experienced in this form of transportation. It was his own opinion that there should be a self-contained bureau and that an effort should be made to keep it from being diverted into channels which had been accustomed merely to the handling of railroad matters. The chart showed 77 in the certificate section, 55 in the traffic section, 81 in the section of accounts, 55 in the section of formal cases, 8 in the section of safety, and 18 in the legal section.

John L. Rogers, director of the new bureau, pointed out that a very large force would be required to handle the applications for certificates and permits. In Pennsylvania, he said, something like 10,000 operators have applied for permits and a force of about 30 people has been working for almost a year trying to get the certificates straightened out, and the federal commission will have 20 times that number of certificates to deal with. He also pointed out that if the commission serves a general order on all the railroads it needs 1300 orders, but to serve a general order on the motor carriers would require in the neighborhood of 250,000.

In determining what will be necessary, Mr. Eastman said, the commission has also had in mind the criticisms made by opponents of the legislation that the commission is "railroad-minded" and is exceedingly anxious to build up an organization captained by men, very largely, who have had actual experience with this form of operation, either in state regulation or in the industry itself, and to maintain close cooperation with the operators. As to the accounting requirements, he said it would be necessary to set up a very simple system for the smaller operators and that he considered it important to refrain from "subjecting the small operators to a lot of red tape and regulation that they cannot possibly comply with."

### Tax on Water Tonnage Proposed

Secretary Morgenthau, of the Treasury, has transmitted to the House ways and means committee a draft of a proposed bill to provide for a tonnage tax on shipments of freight by water in the domestic services, inland, Great Lakes, coastwise and intercoastal, as a contribution toward the expense of maintaining waterways and harbors. Such a plan has been discussed from time to time by President Roosevelt at his press conferences. The proposed bill provides for a tax of 10 cents a ton.

### Inspection of Ashley Planes

The members of the New York Chapter of the Railway and Locomotive Historical Society will make a trip to Wilkes-Barre, Pa., on Sunday, September 8, to inspect the Ashley planes of the Central of New Jersey, which have been in operation for nearly one hundred years. Coal cars of standard capacity are today hauled from Ashley to Mountain Top by the three planes just as efficiently and rapidly as when they were first placed in operation.

Following the inspection of the planes, the party will proceed to the estate of John B. Vaughn, in Kingston, Pa., where the two steam locomotives which he operates as a hobby will be fired up and run for the occasion. One of the locomotives is the old Lehigh Valley inspection engine No. 1, generally known to Lehigh Valley men as the "Dorothy," which is being carefully preserved. Mr. Vaughn will serve a buffet lunch, after which the party will proceed to the Coxton yards of the Lehigh Valley to inspect the motive power at the roundhouse there. The party will return on Lehigh Valley train No. 32.

L. V. train No. 27 (leaving Pennsylvania Station, New York, at 7:15 A. M. standard time) will be used on the outbound trip. Persons interested in the history of railroading are invited to accompany the party, if advance reservations are made with the secretary of the society, P. O. Box 434, Madison Square Station, New York.

## Transcontinental Truck Line Organized

The formation of a nation-wide co-ordinated motor transport organization was made public last week by J. L. Keeshin, president of the Keeshin Motor Express Company, of Chicago. The new company will be known as the Keeshin Transcontinental Freight Lines, and Mr. Keeshin has been elected president.

It is expected that the operations of the new company will begin about October 15, and, while long distance hauling will be its principal business, it will maintain storedoor pick-up and delivery service on all lines and branches. A number of new units have already been purchased, and the present equipment of the Keeshin company, consisting of 520 units, will be increased to 2,500 units for the new transcontinental hauls. Among the first of the new lines to be established will be one between Chicago and the Twin Cities, and another between Chicago and St. Louis. Several vehicles left Chicago on August 26, in a test run to New York, for the purpose of checking time and costs, and comparing with railroad operation between those two points. It is also proposed to offer fifth morning delivery on shipments from Chicago to the Pacific Coast, by means of rail and truck co-ordination.

The new company, it was announced, will co-operate with any railroad wishing to provide rail-highway co-ordinated service. The present Keeshin company has been operating a rail-highway operation for more than a year in connection with the Chicago, Rock Island & Pacific, as described in the *Railway Age* of June 23, 1934, page 931.

## B. & O. Celebrates Centenary of Entrance into Washington

In conjunction with the Smithsonian Institution, the Baltimore & Ohio will mark the one hundredth anniversary of the entrance of the first railroad passenger train into the Nation's Capital with a 130-day exhibit that began on August 25, the centennial date. Featuring the exhibit is the 103-year old, historic "Atlantic" locomotive, the first to enter the Capital in advance of the formal procession when four trains, each hauled by a new locomotive—the "George Washington," "John Adams," "Thomas Jefferson" and "James Madison"—took the dignitaries from Baltimore to Washington for the celebration.

It is expected the "Atlantic" will entertain thousands at the Smithsonian during the coming months, as its long, spindly driving rods, from which it got the nickname of "grasshopper," give it the appearance of running on the rails. One of the double-decked Imlay coaches of a century ago will be coupled with it in the display. Other features of the Smithsonian exhibit will include two animated dioramas. One shows the first B. & O. meeting in 1827. The other is the famous race between the "Tom Thumb" locomotive and a horse, which took place on August 25, five years before the entrance of the railroad into Washington. The Ellicott Mills station bell of 1830, exactly like one provided Washington's first station, a station gong of 1855 from the second B. & O. station in the Capital, and a display of locomotive models, showing a century of development, are also in the display. Of the original locomotives, besides the "Atlantic," that came into Washington in 1835, only the "Thomas Jefferson" has been preserved. It is in the B. & O.'s historic collection at Baltimore.

## R. T. Tickets Interchangeable—B. & O. and N. Y. C.

The New York Central and the Baltimore & Ohio announce that round-trip tickets from New York to western cities—and also similar tickets eastbound—are now available for return by either road; and stop-overs are allowed at principal cities on both systems.

## Bridge Specifications to be Published

The Association of American Railways has authorized Division IV, Engineering, to publish a pamphlet containing all of the pertinent specifications and recommended practices in the Manual of the A.R.E.A. relating to steel and concrete bridges and bridge work this in order that the information may be made readily available to engineers, contractors and vendors of construction materials.

This pamphlet is being published at this time because the rules that have been issued to cover the construction of grade separations with PWA funds provide that all structures to carry railway tracks are to be designed and built in accordance with A.R.E.A. specifications.

## Guffey Bill to Boost Coal Prices

The Guffey bill, providing for the regulation of the bituminous coal industry under a Bituminous Coal Commission and a code system similar to that of the National Recovery Administration, was passed by Congress just before its adjournment. Passage of the bill had been opposed during the committee hearings by the Association of American Railroads, represented by Dr. C. S. Duncan, economist, who argued, among other points, that the bill would increase railroad operating costs by providing for a partisan regulatory body to fix minimum coal prices for various districts.

This regulatory body would also have the power, he said, to dictate to a very large extent at which mines the railroads may secure their coal, while the bill would extend the power of regulation, by an industry-controlled organization, to railroad "captive" mines, which are in the nature of plant facilities. Dr. Duncan also said that "the plan devised by the bill for giving the bituminous coal industry monopolistic powers under the guise of regulation will prove to be a bitter disappointment unless the regulatory powers are administered in the public interest and even then unless corresponding regulations are applied to their competitive substitutes."

## Manchoukuo Line Makes Extensive Gage Change

On August 31, the State Railways of Manchoukuo undertook to change the track gage of 149 miles of line in order to provide through and improved train service between Dairen, a seaport in South Manchoukuo, on the South Manchuria Railway, and Harbin, in North Manchoukuo, on the Manchoukuo State Railways, a distance of approximately 600 miles. Prior to the change in track gage, the north 149 miles of this line, south to Hsinking, the capital of Manchoukuo, owned until recently by the Chinese Eastern Railway, had track gage of 5 ft., while the remainder of the line south of Hsinking, owned by the South Manchuria Railway, had standard gage of 4 ft. 8½ in. This situation, which required the transfer of all through freight at Hsinking, greatly impaired and increased the cost of through train service between Harbin and Dairen, which was unsatisfactory both from the standpoint of the railways, and from that of development of the territory.

In the present gage revision work, the 149 miles of 5-ft. gage was changed to standard gage. As a matter of fact, this entire section of line is being completely over-hauled and improved to permit high-speed through train operation from Dairen to Harbin, which will include the operation of the "Asia," the new high-speed streamlined train of the South Manchuria Railway, which was described in the *Railway Age* of March 23.

Two thousand specially trained workers and supervisors participated in the gage change operations, which, as the result of carefully prepared plans and much preliminary work, was scheduled to be completed in three hours. It is estimated that the improvements in the line, exclusive of bridge repairs, will cost approximately $203,000.

## Crossing Accidents Reduced

The number of persons killed at highway grade crossings in the month of May, as reported by the Association of American Railroads, was 108, as compared with 140 in May, 1934; injured, 297, as compared with 303.

## L. A. Podesta Appointed to Co-ordinator's Staff

L. A. Podesta, superintendent of the Indiana Harbor Belt, Gibson, Ind., has been appointed assistant regional director on the staff of the federal co-ordinator of transportation and has been assigned to the Eastern district, with headquarters at New York.

## Junior Engineers Wanted

The United States Civil Service Commission announces examinations for the position of junior engineer in the government service, at entrance salaries of $2000 a year. Applicants must have a bachelor's degree in engineering. Optional subjects are: Aeronautical, agricultural, ceramics, chemical, civil, electrical, mechanical, mining, petroleum, and structural steel and concrete. Applications must be in by September 16.

## Safety Program for September

The Committee on Education, of the Safety Section, A. A. R., has issued circular S-451, giving to safety committees for the month of September a dozen brief

lectures designed to "stir the mental impulses," which will cause men to do their work in a safe manner. These lectures are illustrated by a dozen little pictures,

two of which are reproduced here. The committee considers its two best pictures those entitled "Moving Trains Can't Think" and "Hand Work Without Headwork."

## French Crossing Barriers

Neon lamps, each with a powerful reflector, in use on highway-crossing barriers of the Paris, Lyons & Mediterranean, have proved so satisfactory, in a long continued test, that the company is now planning to make this improvement at 40 additional crossings.

The P-L-M, like most other railroads, has found itself bearing a considerable expense each year for repairing barriers at highway crossings which have been damaged or destroyed when vehicles were driven into them by careless motorists. The lamp, which is red and is energized by a high-voltage dry battery, is fixed so as to direct its beam to a point in the center of the roadway, about 820 feet distant, but the spread is such that it usually can be seen much farther.

According to the Railway Gazette (London), the number of accidents of this kind has already been much reduced where these lamps are used.

## Steam Railway Accident Statistics May, 1935

The Interstate Commerce Commission's completed statistics of steam railway accidents for the month of May, now in preparation for the printer, will show:

| Item | Month of May 1935 | Month of May 1934 | 5 months ended with May 1935 | 5 months ended with May 1934 |
|---|---|---|---|---|
| Number of train accidents: | | | | |
| Total | 461 | 483 | 2,732 | 2,688 |
| (At highway grade crossings, included in total) | 17 | 7 | 76 | 60 |
| Number of casualties in train, train-service and nontrain accidents: | | | | |
| Trespassers: | | | | |
| Killed | 227 | 250 | 916 | 895 |
| Injured | 277 | 307 | 1,115 | 1,103 |
| Passengers on trains: | | | | |
| Killed | 2 | 1 | 8 | 10 |
| Injured | 103 | 154 | 820 | 663 |
| Employees on duty: | | | | |
| Killed | 42 | 38 | 233 | 244 |
| Injured | 1,259 | 1,335 | 6,487 | 6,873 |
| All other nontrespassers:* | | | | |
| Killed | 117 | 151 | 663 | 660 |
| Injured | 473 | 483 | 2,794 | 2,689 |
| Total—All classes of persons: | | | | |
| Killed | 388 | 440 | 1,820 | 1,809 |
| Injured | 2,112 | 2,279 | 11,216 | 11,328 |

* Casualties to "Other nontrespassers" happen chiefly at highway grade crossings. Total highway grade-crossing casualties *for all classes of persons, including both trespassers and nontrespassers*, were as follows:

| | | | | |
|---|---|---|---|---|
| Killed | 108 | 140 | 630 | 617 |
| Injured | 297 | 303 | 1,884 | 1,786 |

## The End-of-Season Rush

Fifty-seven sleeping cars, carrying passengers returning from New England camps, were scheduled to arrive in New York on Friday, August 30; these passengers being a part of 450,000 which the New York, New Haven & Hartford calculated that it would have to entertain in the five days, August 30-September 3, inclusive. Another item making up this total is the military movement from Pine Camp, N. Y., whence 2958 members of the National Guard are returning to Connecticut.

## Canada Atlantic Reunion

Employees and former employees of the Canada Atlantic (now a part of the Canadian National) held in Ottawa last week a reunion, the first of its kind, at which the attendance is said to have been more than 600. All branches of the service were represented, from engine wipers to executive officers. The chairman of the meeting was W. C. Moore, Master Mechanic at Ottawa. Old members came from Vancouver, Prince Rupert, Baltimore, New York and various points in the Maritime provinces.

The Canada Atlantic was bought by the Grand Trunk about 30 years ago. It included a line from Swanton, Vt. westward to Parry Sound, with a number of branches.

## Rail Travel to Yellowstone Park

Railroad passenger ravel to the Yellowstone National Park has shown substantial increase this year as compared with recent years, according to a report issued by the National Park Service of the Department of the Interior. From the beginning of the season through August 15, a total of 11,571 railroad passengers entered the park as compared with 9,270 in 1934, an increase of 2,301 or nearly 25 per cent, and with 3,934 in 1933, an increase of 7,637, or 195 per cent. During the first 15 days of August, 3,579 railroad passengers entered the park, an increase of 892, or 33 per cent as compared with the same period in 1933. Passengers entering the park from individual railroads up to August 15 of this year included 4,621 from the Union Pacific, as compared with 3,296 in the corresponding period last year; 4,185 from the Northern Pacific, as compared with 3,296; 2,053 from the Chicago, Burlington

* * * *

176 Cars Were Parked in Pullman City, Which Was Constructed Especially for the International Rotary Convention at Mexico City on June 17-21

& Quincy, as against 1,742; and 684 from the Chicago, Milwaukee, St. Paul & Pacific, as compared with 598.

### P. R. R. Scholarships

The Pennsylvania has announced awards of the Frank Thomson scholarships, two in number, to sons of P. R. R. employees, for four-year terms beginning with the academic year 1935-36. The young men who achieved this success, in a field of 31 competitors, are Charles William Zahler, Jr., of Buffalo, N. Y., and Allen Garland Eickmeyer, of Ft. Wayne, Ind. Mr. Zahler is the son of Charles W. Zahler, Sr., collector in the road's real estate department at Pittsburgh. He will attend the Towne Scientific School of the University of Pennsylvania where he will study civil engineering. Mr. Eickmeyer is the son of W. H. Eickmeyer, fireman and extra engineman on the Fort Wayne division. He will attend the School of Chemical Engineering at Purdue University.

The scholarships are worth $800 annually to each appointee and are awarded for the term of a full four-year course in an engineering or allied subject at any college or university in the United States. They are supported from the income of a memorial trust fund established in 1907 by the children of Frank Thomson, sixth president of the railroad, who held office from 1897 to 1899.

Since the founding of the scholarships, 51 young men have been educated under the provisions of the endowment and six others are still in college, in addition to the two new appointees announced today.

# Equipment and Supplies

### Equipment for Canadian Railroads

Railway equipment orders amounting to $9,821,563 have been allocated to five manufacturing plants in eastern Canada. The shops of the Canadian National will manufacture equipment to the value of $1,325,000. An appropriation of $15,000,000 was provided in an act for railway purposes passed by Parliament recently. The Canadian National and the Canadian Pacific will have the use of the equipment for two years without interest, after which they will pay off the principal in installments with interest at 4 per cent. The Canadian National will receive $6,791,155 worth of new cars and locomotives and the Canadian Pacific orders will total $4,355,408.

The Canadian National equipment orders are for 250 automobile cars and 80 sand cars to the Canadian Car & Foundry Co.; 150 automobile cars and 8 snow plows to the National Steel Car Corporation; 200 refrigerator cars and 250 gondola cars to the Eastern Car Company; 5 locomotives of the 4-8-4 type, U-2-D, and 5 of the 4-8-4 type, U-4-A, to the Montreal Locomotive Works; 5 locomotives of the 2-8-2 type, S-4-B, to the Canadian Locomotive Company, and 250 refrigerator cars to the Canadian National's own shops.

The Canadian Pacific equipment orders include 700 steel sheathed box cars to the Canadian Car & Foundry Co.; 150 refrigerator cars, 100 hopper cars and 170 composite high-side drop bottom gondola cars to the National Steel Car Corporation. Inquiry for the cars included in this equipment was reported in the *Railway Age* of June 29, page 1055.

## FREIGHT CARS

THE CALIFORNIA DISPATCH LINE is inquiring for two tank cars of 8,000 gal. capacity.

THE INTERNATIONAL PETROLEUM COMPANY, LTD., has ordered two tank cars of 40 tons' capacity, from the American Car & Foundry Company, for export.

THE CHICAGO, ROCK ISLAND & PACIFIC has contracted with the Ryan Car Company, Chicago, for the conversion of 320 box cars into single-deck stock cars.

THE GRAND TRUNK WESTERN has ordered 100 gondola cars of 70 tons' capacity from the Magor Car Corporation. Inquiry for this equipment was reported in the *Railway Age* of June 15.

## PASSENGER CARS

THE MISSOURI & NORTH ARKANSAS is inquiring for two trains, each consisting of one 75-ft., 10-in. steel mail and baggage car equipped with gas-electric power plant, and one 55-ft. trailer coach.

## IRON AND STEEL

THE BALTIMORE & OHIO has ordered from the Phoenix Bridge Company, 150 tons of steel for bridge work at Peth, N. Y.

THE VIRGINIAN has ordered 150 tons of structural steel from the Virginia Bridge & Iron Company for a steel girder at Ingleside, W. Va.

THE SEABOARD AIR LINE has placed an order for 11,900 tons of rail, dividing the order equally between the Tennessee Coal, Iron & Railroad Company and the Bethlehem Steel Company.

THE NEW YORK CENTRAL will receive bids until 12 o'clock noon, Daylight Saving Time, September 4, at New York, for steel rail 7,400 tons and maintenance of way materials required on its system.

THE CHICAGO, BURLINGTON & QUINCY has ordered 400 tons of structural steel from the American Bridge Company, Pittsburgh, Pa., and 20 tons from Wendnagel & Co., Chicago, all of which is to be used in the reconstruction of bridges in Nebraska.

WHEELING & LAKE ERIE.—The Arundel Corporation, Baltimore, Md., which has the contract for relocating 14.6 miles of the trackage of the Wheeling & Lake Erie in the vicinity of the Dover reservoir in Ohio, has ordered 2500 tons of rails from the Carnegie Steel Company for use in carrying out the relocation.

## MISCELLANEOUS

SEABOARD AIR LINE.—The American Car & Foundry Company has placed an order with the Timken Roller Bearing Company, Canton, Ohio, for the necessary bearings and boxes to equip three rail cars for the Seaboard Air Line.

THE GRAND TRUNK WESTERN has placed an order with the Timken Roller Bearing Company, Canton, Ohio, for bearings and boxes to equip the engine trucks of three of its existing 4-8-4 type, road class U-3-A, steam locomotives.

# Supply Trade

**The Republic Steel Corporation,** Youngstown, Ohio, on September 1, will open a new sales office at 622 Dwight building, Kansas City, Mo., which will be in charge of **Robert L. Pierce** of the St. Louis, Mo., district sales office.

**George Kirtley,** formerly in charge of the Pittsburgh district for the **Plymouth Locomotive Works,** division of **The Fate-Root-Heath Company,** Plymouth, Ohio, has been appointed assistant to the vice-president, **E. W. Heath,** in charge of locomotive sales and advertising, with headquarters at Plymouth. Mr. Kirtley has had 12 years' experience in the application of steam and internal-combustion locomotives to a wide variety of services.

**R. J. Wysor,** vice-president in charge of operations of the **Republic Steel Corporation,** Youngstown, Ohio, has been elected executive vice-president and general manager, to succeed **Ben F. Fairless,** who has resigned to go with the **United States Steel Corporation. C. M. White,** assistant vice-president of the Republic Steel Corporation, has been elected vice-president in charge of operations, to replace Mr. Wysor. Both men will take office on September 16.

**The United States Steel Corporation** announces that it has approved, effective October 1, a unified plan of operation of the **Carnegie Steel Company** and the **Illinois Steel Company,** both wholly-owned subsidiaries of the United States Steel Corporation, under which the direction of production and sales will be controlled from a central office to be set up in Pittsburgh, Pa. **Benjamin F. Fairless,** formerly executive vice-president of the Republic Steel Company, will head the new organization.

## OBITUARY

**Harry E. Stitt,** until recently chief engineer of The Austin Company, Cleveland, Ohio, and later consulting engineer, died in Cleveland on August 23. Mr. Stitt was born at Blairsville, Pa., in 1877, and was graduated from Pennsylvania State College in civil engineering in 1903. He

*Continued on next left-hand page*

# MODERN POWER

## *REDUCES* TON-MILE COSTS

Without increasing the number of drivers and without exceeding present weight limitations of track and bridges, modern motive power is capable of doubling the drawbar pull as compared with power built ten or more years ago.

Such power costs less to maintain and has double the earning capacity—two vital factors in reducing ton-mile costs.

LIMA LOCOMOTIVE WORKS, INCORPORATED, LIMA, OHIO

LIMA LOCOMOTIVE WORKS INCORPORATED

was then employed successively by Heyl & Patterson and the Jones & Laughlin Steel Company, at Pittsburgh; the Carnegie Steel Company, at Youngstown; and the Arthur G. McKee Company and Anton Burchard, in Cleveland. Mr. Stitt went to The Austin Company as chief engineer in 1914. He was a member of the Cleveland Engineering Society. Mr. Stitt was a pioneer in promoting the principle of standardized unit construction for modern industrial and railroad buildings; he was also interested in the application of welding to building construction.

**Johnston P. Porter,** a contractor who was identified with the building of a large mileage of railroad lines in the Northwest, died on August 19 at St. Catherine's, Ont.

**Edwin E. Boehne,** manager of the sales department of the International Creosoting & Construction Co., Galveston, Tex., who died suddenly on August 12, as noted in the *Railway Age* for August 17, was born on September 24, 1877, at Woodville, Ill. Early in his business career, Mr. Boehne became connected with the

Edwin E. Boehne

wood preserving plant of the Union Pacific at Laramie, Wyo. He entered the service of the International Creosoting & Construction Co. in January, 1907, and was connected continuously with this company until his death. He served as cashier and assistant manager of the plant department at Beaumont, Tex., until July, 1911, when he was transferred to the lumber and sales department at Galveston. He was appointed manager of the sales department in January, 1916.

## TRADE PUBLICATIONS

LARGE PILE CONCRETE TRESTLES.—The Portland Cement Association, Chicago, has published a 12-page well-illustrated pamphlet bearing this title which discusses the advantages and applications of large pile concrete trestles.

SMALL STORAGE BATTERIES.—The Gould Storage Battery Company has issued a bulletin, No. 960, which illustrates and describes small Plante-Paste storage batteries for signal and other small railroad power requirements. These batteries are made up of sealed-in-glass stationary cells. There are two sizes, having, respectively, capacities of 16 and 28 amp. hr.

BUCKET.—The Industrial Brownhoist Corporation, Bay City, Mich., has issued Catalog 353, comprising 20 pages illustrating and describing its line of clamshell and grab buckets, and grapples, in capacities ranging from 10 to 400 cu. ft. Illustrations depict both construction and application, while tables give the weights and all dimensions necessary for the selection of buckets for various types of service.

# Construction

ATCHISON, TOPEKA & SANTA FE.—A contract has been awarded to F. M. Spencer & Son, Topeka, Kan., for the construction of a battery repair shop at Topeka.

ATCHISON, TOPEKA & SANTA FE.—A general contract for the construction of a one-story addition to the car and locomotive shops at Topeka, Kan., has been awarded to the Austin Company, Cleveland, Ohio.

SOUTHERN PACIFIC. — The California State Highway Department has awarded a contract to E. W. Heple, San Jose, Cal., for the construction of the sub-structure of a highway subway, including 0.29 miles of paving, under the tracks of this company south of Agnew, Cal., at a cost of $103,850.

STATEN ISLAND RAPID TRANSIT RAILWAY COMPANY.—This company, a subsidiary of the Baltimore & Ohio, will receive bids until September 20, through H. A. Lane, chief engineer, Baltimore, Md., for grading, masonry and other heavy construction in connection with the elimination of grade crossings at Tompkinsville-Stapleton, Staten Island, N. Y.

VIRGINIAN.—A contract has been given to Walton Sudduth Company, Inc., Bluefield, W. Va., for the construction of a steel girder on concrete substructure at Ingleside, W. Va., M.P. 334.5. The Virginia Bridge & Iron Company has been given the contract for 150 tons of steel to be used on the superstructure.

WESTERN MARYLAND.—Work will be carried out by this company's forces constructing a new seven-stall enginehouse and a new turntable at Elkins, W. Va., to cost about $80,000.

# Financial

ALABAMA, TENNESSEE & NORTHERN.—*Reorganization Plan.*—This company has filed with the Interstate Commerce Commission a plan of reorganization proposing to reduce the outstanding capitalization from $8,140,000 to $2,472,000 plus an amount of no-par capital stock and to reduce the fixed charges from $239,546 to $36,000.

CHICAGO, MILWAUKEE, ST. PAUL & PACIFIC.—*To Pay R. F. C. Interest.*—The Federal Court in Chicago on August 27 authorized this company to pay the Reconstruction Finance Corporation $210,000 in overdue interest and to pay the annual rental of $1,000,000 for the lease of the Chicago, Terre Haute & Southeastern.

ERIE.—*Bonds.*—The Long Island Docks Company, whose property is operated by the Erie under lease, has applied to the Interstate Commerce Commission for authority to extend the maturity date of $7,500,000 of consolidated mortgage bonds from October 1 to October 1, 1950, with interest at 3¾ per cent.

KANSAS, OKLAHOMA & GULF.—*Bonds.*—The Interstate Commerce Commission has authorized this company to issue $219,000 of first mortgage 5 per cent, series 1978, bonds to be sold at not less than 99 and the proceeds used to retire outstanding obligations.

MAINE CENTRAL.—*Bonds.*—This company has applied to the Interstate Commerce Commission for authority to issue, sell, exchange, or otherwise dispose of $13,949,000 of first mortgage and collateral 4 per cent bonds and $11,500,000 of general mortgage 4½ per cent bonds for the purpose of carrying out a plan for refunding $20,000,000 of first and refunding mortgage bonds and $2,000,000 of collateral trust bonds. Holders of each $1,000 of the bonds are to receive in exchange $500 of first mortgage and collateral bonds or $500 in cash and $500 of general mortgage bonds and the Reconstruction Finance Corporation has agreed, subject to the commission's approval, to make a loan for the cash required.

MISSOURI & ARKANSAS.—*Acquisition of Stock.*—The Interstate Commerce Commission has authorized the Missouri & Arkansas Railway Co., to acquire and operate the line formerly owned by the Missouri & North Arkansas between Joplin, Mo., and Helena, Ark., and to issue $350,000 of capital stock, the stock to be delivered at par in payment for the properties, which were sold at foreclosure for $350,000 on March 12 last.

NEW YORK, CHICAGO & ST. LOUIS.—*Notes.*—The Interstate Commerce Commission has authorized this company to issue not exceeding $15,000,000 of new or extended promissory notes in payment of or in exchange for an equal amount of notes which will mature on October 1.

NORFOLK SOUTHERN. — *Abandonment.* — The receivers have applied to the Interstate Commerce Commission for authority to cease operation over the line of the Atlantic & North Carolina under lease.

NORFOLK SOUTHERN.—*P. W. A. Loan.*—The Interstate Commerce Commission has authorized the receivers of this company to borrow $960,000 from the Public Works Administration to assist in financing the purchase of 500 40-ton steel box cars sheathed with wood at a total cost of $1,067,730.

PENNSYLVANIA. — *Trackage Rights.* — The Interstate Commerce Commission has authorized this company to operate under trackage rights over approximately one-quarter of a mile of track at Walford, Pa., owned by the Bessemer Limestone & Cement Co., and 3.4 miles of main line

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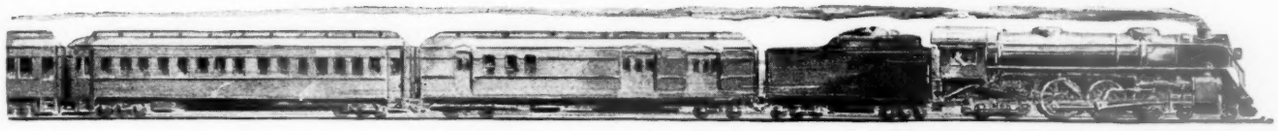
# AIR CONDITIONING

## WON'T COMPENSATE

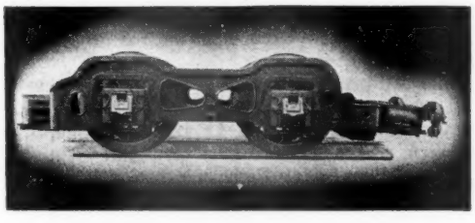
## FOR TRAIN DELAYS!



Speed is, today, the keynote of railroad operation.

Air conditioned comfort is essential but secondary to the requirement to fast, "on time" trains.

To maintain operating standards with air conditioned trains extra power is needed for smooth starting, quick acceleration and to get over the tight places.



Except by use of heavier power or an extra locomotive, The Locomotive Booster is the only means of providing it.

The added power of Booster locomotives saves minutes at every stop, avoids the need for rough handling in starting and safeguards against delays.

Booster locomotives enhance the value of every other effort made to improve passenger service.

The close tolerances essential to efficient Booster operation call for genuine repair parts made by Franklin.

**FRANKLIN RAILWAY SUPPLY COMPANY, INC.**

NEW YORK CHICAGO MONTREAL

and 8.1 miles of siding owned by the Mahoning State Line R. R. (P. & L. E.) between Walford and Hillsville.

PENNSYLVANIA. — *Bonds.* — An issue of $50,000,000 of Pennsylvania Company 4 per cent secured bonds, maturing in 1963, is being offered by Kuhn, Loeb & Co. at 100. The bonds will be a direct obligation of the company and will be secured by the pledge of 375,000 shares of common stock of the Norfolk & Western, which is priced at $190 a share. All of the capital stock of the Pennsylvania Company is owned by the Pennsylvania Railroad. Proceeds of the issue will be used together with funds in the company's treasury to redeem, on November 1 at 105 and accrued interest, the company's 4¾ per cent secured bonds, due 1963, now outstanding to the amount of $50,000,000, including $1,861,000 in the company's treasury. Underwriting discounts are $1,250,000, or 2½ per cent, and the net proceeds of the issue will be $48,750,000. Provision is made for a sinking fund.

ST. LOUIS-SAN FRANCISCO.—*Allowances to Trustee of Prior Lien Mortgage for Expenses.*—Upon petition of the Central Hanover Bank & Trust Company, corporate trustee of the prior lien mortgage of this company of July 1, 1916, the Interstate Commerce Commission has authorized the payment of $21,669 for legal expenses in respect of services rendered prior to pending proceedings for the reorganization of the company under the Bankruptcy Act.

SOUTHERN PACIFIC.—*E. P. & S. W. Bonds.*—The Interstate Commerce Commission has authorized the El Paso & South Western to issue $387,000 of first and refunding mortgage 50-year bonds in reimbursement of capital expenditures, the issue to be sold at par to the Southern Pacific and the proceeds used to repay, in part, advances from that company.

### Average Prices of Stocks and of Bonds

| | Aug. 27 | Last week | Last year |
|---|---|---|---|
| Average price of 20 representative railway stocks.. | 35.52 | 36.17 | 36.88 |
| Average price of 20 representative railway bonds.. | 74.11 | 74.27 | 74.26 |

# Railway Officers

## FINANCIAL, LEGAL AND ACCOUNTING

**W. H. Hobbs,** assistant secretary of the Canadian National, with headquarters at Montreal, Que., has been appointed secretary, succeeding **R. P. Ormsby,** who has retired. Mr. Hobbs was born in England in 1891 and was educated there. He began his railway career in London with the South Eastern and joined the staff of the financial vice-president of the Grand Trunk in Montreal in 1913 He was shortly afterwards transferred to the president's office as secretary to the president, and in 1921-22 he served as assistant secretary of the Grand Trunk. Upon the formation of the consolidated Canadian National Railway System in 1923, Mr. Hobbs was appointed secretary to the chairman and president, which position he held until his appointment as assistant secretary in 1932.

Mr. Ormsby was born in Ireland in 1869 and was educated in England. He was graduated from Cambridge University in

W. H. Hobbs

1891, and went to Canada in 1896. After serving in various capacities, he became secretary to the legal adviser of the Canadian Northern interests. When the Canadian Northern System was taken over by the government in 1918, Mr. Ormsby was appointed secretary, and when the consolidation became effective in 1923, he became secretary of the consolidated system.

## OPERATING

**C. E. Hinchman,** assistant superintendent of the Indiana Harbor Belt, with headquarters at Gibson, Ind., has been appointed acting superintendent, to serve during the absence of **L. A. Podesta,** who has accepted a position on the staff of the federal co-ordinator of transportation. Mr. Podesta has been granted a ten months furlough.

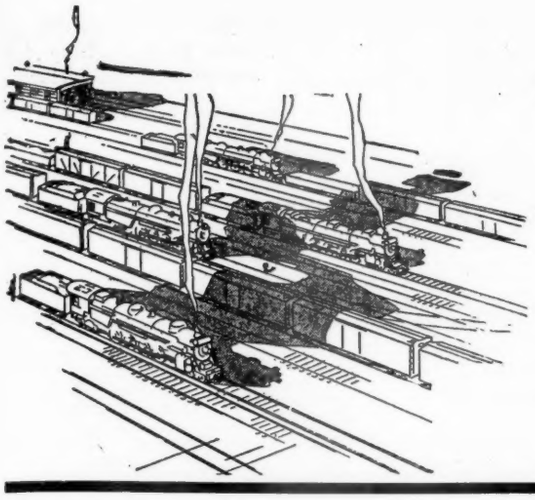
**W. J. MacGreevy,** superintendent of the Los Angeles division of the Railway Express Agency, who has been appointed general manager of the Trans-Missouri department, as noted in the *Railway Age* for August 24, has been in the railway express business for 26 years. After graduating from Columbia university in 1908, Mr. MacGreevy became connected with the express company as a clerk, being transferred to the office of the vice-president and general manager in 1909. Beginning in 1911, Mr. MacGreevy served for a time in the money order department and later held such positions as cashier at Decatur, Ill., agent at Louisville, Ky., and route agent at Canton, Ohio. After four years in the latter position, Mr. MacGreevy was made secretary to the assistant to the vice-president, and in 1918 he became secretary to the vice-president. In April, 1931, he was appointed assistant to the vice-president of the Central department. In 1933, he was transferred to San Francisco and on March 1 of the following year he was made superintendent of the Los Angeles division, the position he was holding at the time of his recent appointment as general manager of the Trans-Missouri department.

**W. W. Argabrite,** chief clerk to the general manager of the South Pacific department of the Railway Express Agency, who has been appointed superintendent of the Los Angeles division, as noted in the *Railway Age* for August 24, has had 32 years of experience in the express business in the west. He entered the service with a predecessor of the Railway Express Agency in June, 1903, as a messenger's helper. After serving in various capacities he was appointed agent at Bakersfield, Cal., in 1905. Five years later Mr. Argabrite was promoted to route agent, with the same headquarters, being transferred to Fresno, Cal., in 1911. Thereafter he served as agent at San Diego, Cal., for 2 years; as general agent at San Antonio, Tex., for nearly a year; and as chief clerk to the agent and to the city superintendent in San Francisco, Cal., in 1915. In 1919, he was appointed claim agent in the latter city and in the following year he was made chief clerk to the superintendent of the Los Angeles division. In December, 1933, Mr. Argabrite was appointed chief clerk to the general manager of the South Pacific department, with headquarters at Los Angeles, the position he was holding at the time of his recent appointment.

W. W. Argabrite

**F. C. Rockey,** general agent for the Railway Express Agency, with headquarters at Denver, Colo., who has been appointed superintendent of the Southern California-Arizona-New Mexico division, as noted in the *Railway Age* for August 24, first entered the service of the express company at Des Moines, Iowa, in 1900. From that year until the consolidation of the various railway express companies in 1918, Mr. Rockey served in various positions with several companies, including those of route agent at Portland, Ore., and Salina, Kan.; as assistant general agent at Denver, Colo.; as general agent at Topeka, Kan.; and as agent at San Francisco, Cal. In 1918, following the consolidation, he was appointed agent for the Railway Express Agency at Seattle,

*Continued on next left-hand page*



# SECURITY ARCH LOCOMOTIVES

## *MUST STEAM FREELY*

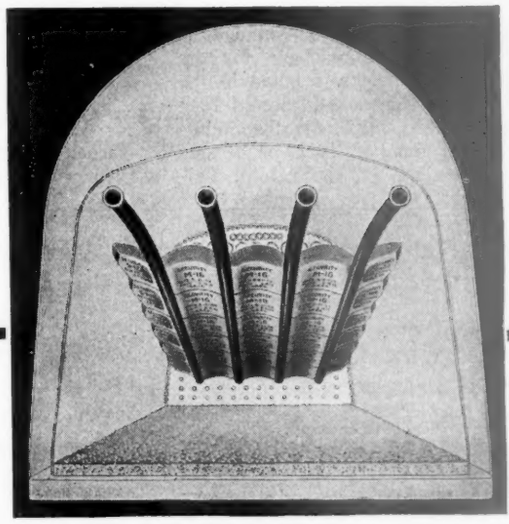
**In the design of locomotive boilers a definite steaming capacity is provided for.**

**To develop this capacity, however, a number of factors are involved.**

**Unless Security Arch locomotives develop their rated capacity economically and efficiently—out goes one of the American Arch Company service men to find the trouble and help solve it.**

**These men have a rich practical experience in locomotive operation and a thorough knowledge of combustion.**

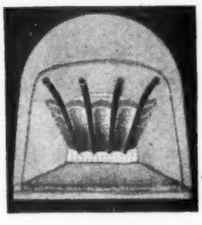
**American Arch Company alone has behind it the long experience and the organization to give such service.**



*There's More To*
SECURITY ARCHES
*Than Just Brick*

**HARBISON-WALKER REFRACTORIES CO.**

***Refractory Specialists***



**AMERICAN ARCH CO.**
**INCORPORATED**

***Locomotive Combustion Specialists*** » » »

Wash., being transferred to Los Angeles in the following year. In June, 1925, Mr. Rockey was appointed general agent at

F. C. Rockey

Denver, which position he was holding at the time of his recent appointment as superintendent.

## TRAFFIC

**Samuel S. Bretz,** who retired as general freight agent for the Central of New Jersey, as reported in the *Railway Age* of August 24, entered railway service in June, 1892, as a messenger for the Central of New Jersey at Mauch Chunk, Pa. Mr. Bretz became clerk to division freight agent at Mauch Chunk in March, 1893, and was appointed division freight agent in August, 1920, with the same headquarters. In April, 1924, he became assistant general freight agent at New York and in November, 1926, was appointed general freight agent at New York, the position he held until his retirement.

**Don Y. Smith,** whose appointment as assistant freight traffic manager for the Central of New Jersey was noted in the *Railway Age* of August 24, entered railway service in July, 1910, with the Southern Pacific. In October, 1912, he became rate and claim clerk for the Lehigh Valley and in 1914 he was appointed soliciting freight agent, later becoming chief clerk to general freight agent. During the war Mr. Smith was furloughed to the freight traffic committee. After serving as an industrial traffic manager for several years, he became traveling freight agent for the Reading at Philadelphia in May, 1922. Mr. Smith served successively as freight traffic representative, assistant general agent, general agent and general freight agent for the Central of New Jersey.

**H. J. Nelson,** whose appointment as assistant freight traffic manager for the Central of New Jersey was noted in the *Railway Age* of August 24, entered the service of the Central of New Jersey in June, 1897, as ticket agent and telegraph operator. He became extra agent and telegraph operator in July, 1899, and in April, 1900, was appointed traveling auditor. Mr. Nelson was appointed chief clerk in April, 1903, freight agent in February, 1905, general eastern and foreign freight agent in June, 1926, and general freight agent in March, 1933, which position he

H. J. Nelson

held until his recent appointment as assistant freight traffic manager, with headquarters at New York.

**James V. Whalen,** whose appointment as general passenger agent in charge of solicitation of the New York, New Haven & Hartford was noted in the *Railway Age* of August 24, was born at New Haven,

James V. Whalen

Conn. He entered the service of the New York, New Haven & Hartford in August, 1914, and after serving in various capacities was appointed chief clerk at New York in July, 1924. The following year he was transferred to Boston in the same capacity and in September, 1933, Mr. Whalen was promoted to New England passenger agent at Boston, Mass., which position he held until his recent appointment as general passenger agent in charge of solicitation, with headquarters at Boston.

## OBITUARY

**Frank E. Pettibone,** general agent for the Chicago Great Western at Milwaukee, Wis., died in that city on August 5.

**George H. Smitton,** who retired in 1928 as assistant general freight agent on the Great Northern, with headquarters at Portland, Ore., died at the Good Samaritan hospital in Portland on August 22.

**Col. R. F. White,** general counsel of the Louisiana & Arkansas, died at Shreveport, La., on August 18 after several months' illness. Col. White was 46 years old.

## Net Income for June and Six Months of Calendar Year Ended June 30, 1935

| | | Net Income 1935 | Net Income 1934 |
|---|---|---|---|
| Akron, Canton & Youngstown | June | 10,766 | 10,768 |
| | 6 mos. | 105,035 | 76,173 |
| Alton | June | — 368,478 | — 92,149 |
| | 6 mos. | — 1,389,423 | — 911,184 |
| Atchison, Topeka & Santa Fe System | June | 2,321,949 | 2,473,617 |
| | 6 mos. | 1,424,398 | 1,166,402 |
| Atlanta & West Point | June | — 17,506 | — 23,554 |
| | 6 mos. | — 46,415 | — 62,771 |
| Western of Alabama | June | — 20,757 | — 14,706 |
| | 6 mos. | — 76,346 | — 46,536 |
| Atlanta, Birmingham & Coast | June | — 23,786 | — 40,610 |
| | 6 mos. | — 103,231 | — 149,255 |
| Atlantic Coast Line | June | — 646,032 | — 637,762 |
| | 6 mos. | — 450,409 | 1,172,047 |
| Charleston & Western Carolina | June | — 8,364 | — 3,714 |
| | 6 mos. | 51,417 | 115,619 |
| Baltimore & Ohio | June | 73,987 | 613,621 |
| | 6 mos. | — 2,496,157 | — 2,400,706 |
| Bangor & Aroostook | June | 8,838 | — 51,300 |
| | 6 mos. | 961,944 | 824,403 |
| Bessemer & Lake Erie | June | 283,444 | 383,207 |
| | 6 mos. | 370,139 | 27,278 |
| Boston & Maine | June | 50,263 | — 19,269 |
| | 6 mos. | — 283,145 | — 568,848 |
| Burlington-Rock Island | June | — 108,556 | — 85,329 |
| | 6 mos. | — 543,215 | — 498,783 |
| Cambria & Indiana | June | 57,168 | 43,370 |
| | 6 mos. | 424,809 | 401,214 |
| Canadian Pac. Lines in Maine | June | None | None |
| | 6 mos. | None | None |
| Canadian Pac. Lines in Vermont | June | None | None |
| | 6 mos. | None | None |
| Central of Georgia | June | — 278,780 | — 338,201 |
| | 6 mos. | — 1,479,985 | — 1,468,076 |
| Central New Jersey | June | 45,773 | — 111,305 |
| | 6 mos. | — 516,746 | 7,376 |
| Central Vermont | June | — 29,751 | — 128,941 |
| | 6 mos. | — 417,507 | — 651,162 |
| Chesapeake & Ohio | June | 3,273,008 | 2,514,106 |
| | 6 mos. | 13,487,586 | 13,976,822 |
| Chicago & Eastern Illinois | June | — 190,083 | — 100,903 |
| | 6 mos. | — 854,658 | — 991,762 |
| Chicago & Illinois Midland | June | 8,465 | 4,422 |
| | 6 mos. | 118,073 | 2,132 |
| Chicago & North Western | June | — 1,410,923 | — 745,968 |
| | 6 mos. | — 6,814,307 | — 5,708,466 |
| Chicago, Burlington & Quincy | June | — 1,456,542 | — 254,378 |
| | 6 mos. | — 3,542,392 | — 157,533 |
| Chicago Great Western | June | — 142,271 | — 81,339 |
| | 6 mos. | — 962,333 | — 614,168 |
| Chicago, Indianapolis & Louisville | June | — 121,939 | — 176,972 |
| | 6 mos. | — 819,979 | — 1,040,358 |
| Chicago, Mil., St. Paul & Pacific | June | — 2,844,769 | — 1,537,624 |
| | 6 mos. | —10,309,417 | — 8,734,700 |

*Continued on next left-hand page*

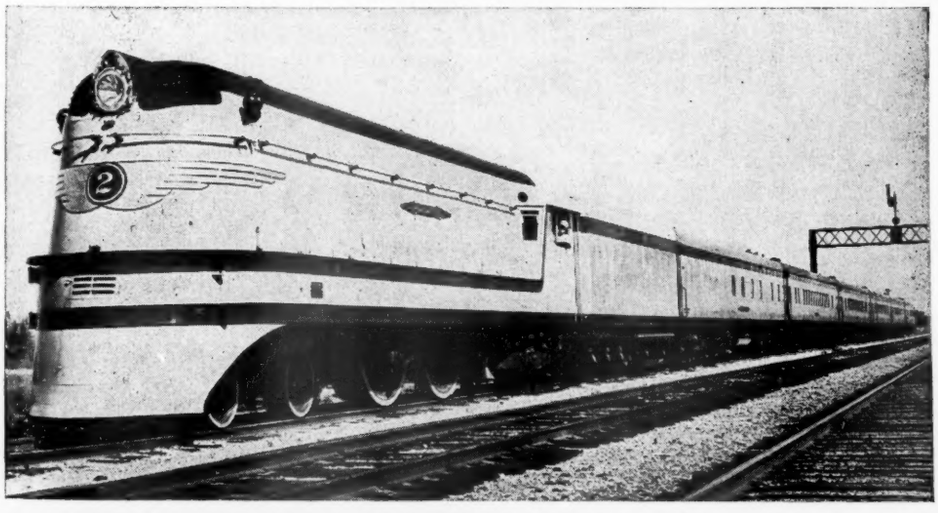
# FLEXIBILITY

GOOD railroading calls for safe, uninterrupted, punctual service through all kinds of weather. The lack of restriction in horsepower available in the steam locomotive allows a power unit to be built to maintain schedules under adverse conditions. This means a certain surplus of power under favorable conditions, allowing more cars to be attached to the train if the demand arises.

The "HIAWATHA" was built to induce the traveling public again to patronize the railroad. It was guaranteed to handle six cars on a very exacting schedule. The traveling public reacted so favorably that in a short time the train was increased to seven cars. Then an extra stop was added to the schedule. Lately, an eighth car has had to be added to the train. And in the meantime, the same original exacting schedule is still being regularly maintained.

***As we have ever understood it, this flexibility always has been a positive requirement of good railroading.***

AMERICAN LOCOMOTIVE COMPANY



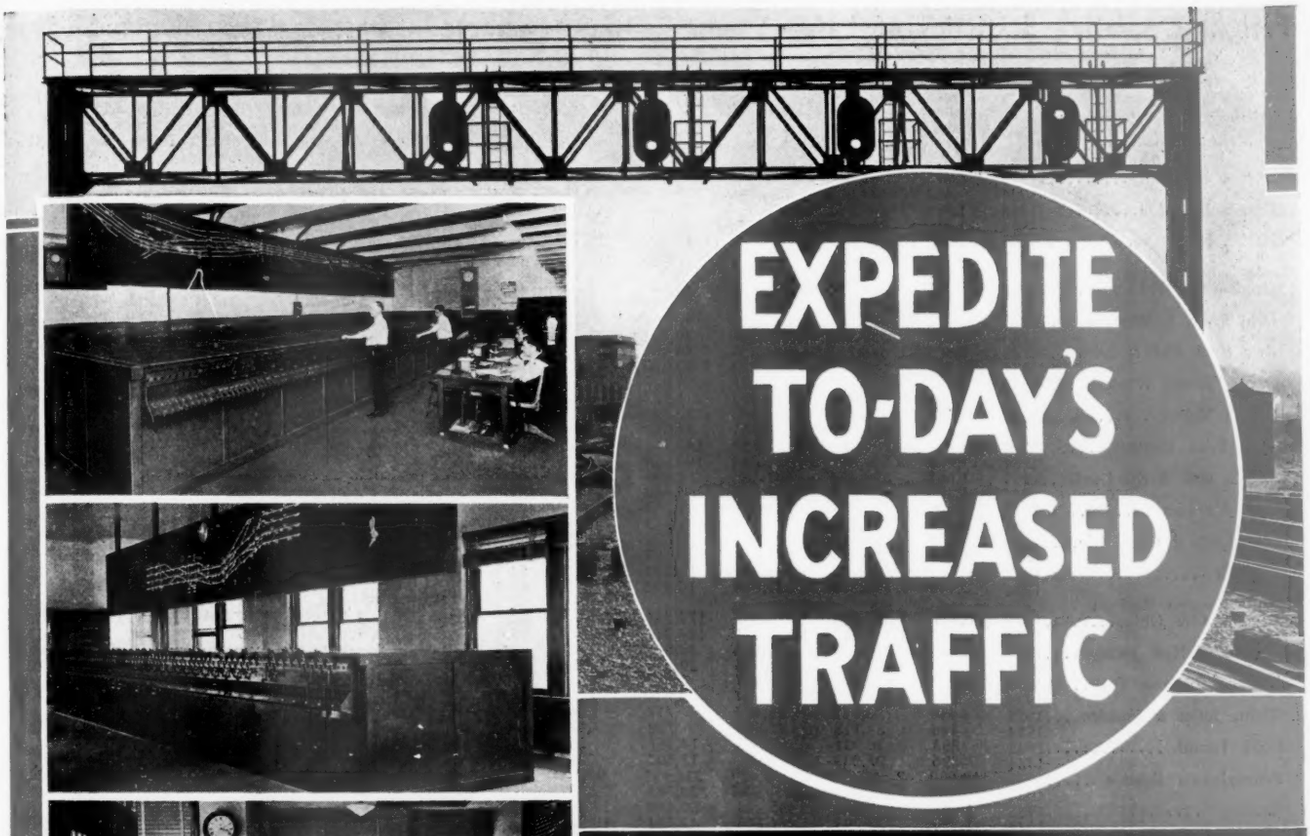
30 CHURCH STREET · NEW YORK · N.Y.

ALCO

# Net Income for June and Six Months of Calendar Year Ended June 30, 1935 (Continued)

| | | Net Income 1935 | Net Income 1934 |
|---|---|---|---|
| Chicago, Rock Island & Pacific | June | — 1,745,157 | — 700,950 |
| | 6 mos. | — 8,697,785 | — 6,281,539 |
| Chicago, Rock Island & Gulf | June | — 220,011 | — 216,460 |
| | 6 mos. | — 740,010 | — 764,694 |
| Chicago, St. Paul, Minn. & Omaha | June | — 340,380 | — 194,952 |
| | 6 mos. | — 1,575,359 | — 1,038,243 |
| Clinchfield R. R. | June | — 95,164 | — 82,864 |
| | 6 mos. | — 363,919 | — 60,447 |
| Colorado & Southern | June | — 109,302 | — 61,770 |
| | 6 mos. | 1,114,937 | — 581,147 |
| Ft. Worth & Denver City | June | — 103,996 | 116,518 |
| | 6 mos. | — 603,383 | — 150,644 |
| Columbus & Greenville | June | — 4,926 | — 9,615 |
| | 6 mos. | — 29,852 | — 9,459 |
| Delaware & Hudson | June | — 96,763 | — 235,235 |
| | 6 mos. | — 1,050,626 | — 1,035,450 |
| Delaware, Lackawanna & Western | June | — 250,109 | 31,083 |
| | 6 mos. | — 883,620 | — 180,965 |
| Denver & Rio Grande Western | June | — 600,565 | — 263,295 |
| | 6 mos. | — 2,583,611 | — 1,650,993 |
| Denver & Salt Lake | June | 43,195 | 5,130 |
| | 6 mos. | 230,096 | — 97,747 |
| Detroit & Mackinac | June | — 10,990 | — 13,738 |
| | 6 mos. | — 71,098 | — 30,463 |
| Detroit & Toledo Shore Line | June | 47,374 | 24,974 |
| | 6 mos. | 490,214 | 452,555 |
| Detroit, Toledo & Ironton | June | 103,106 | 65,623 |
| | 6 mos. | 1,528,665 | 909,784 |
| Duluth, Missabe & Northern | June | 1,015,163 | 785,095 |
| | 6 mos. | 147,422 | — 1,110,674 |
| Duluth, Winnipeg & Pacific | June | — 70,686 | — 56,098 |
| | 6 mos. | — 305,869 | — 246,988 |
| Elgin, Joliet & Eastern | June | 68,687 | 91,792 |
| | 6 mos. | 900,105 | 44,136 |
| Erie Railroad (Including Chi. & Erie) | June | 75,906 | 5,450 |
| | 6 mos. | — 668,000 | 881,335 |
| New Jersey & New York | June | — 32,815 | — 36,625 |
| | 6 mos. | — 243,145 | — 231,182 |
| N. Y., Susquehanna & Western | June | 623 | — 43,349 |
| | 6 mos. | — 152,629 | — 53,041 |
| Florida East Coast | June | — 505,652 | — 509,653 |
| | 6 mos. | — 957,432 | — 527,212 |
| Fort Smith & Western | June | — 36,680 | — 28,109 |
| | 6 mos. | — 192,482 | — 171,247 |
| Georgia R. R. | June | 386 | — 38,068 |
| | 6 mos. | — 69,875 | — 123,713 |
| Georgia & Florida | June | — 45,836 | — 54,769 |
| | 6 mos. | — 327,708 | — 324,805 |
| Grand Trunk Western | June | — 46,714 | — 100,118 |
| | 6 mos. | — 193,666 | — 281,803 |
| Canadian Nat'l Lines in New Eng. | June | — 141,923 | — 120,236 |
| | 6 mos. | — 738,710 | — 578,261 |
| Great Northern | June | 611,824 | 1,462,167 |
| | 6 mos. | — 3,298,082 | — 4,475,436 |
| Green Bay & Western | June | — 6,477 | — 10,016 |
| | 6 mos. | 69,325 | — 28,732 |
| Gulf & Ship Island | June | — 7,173 | — 21,897 |
| | 6 mos. | — 84,834 | — 83,136 |
| Gulf, Mobile & Northern | June | 22,000 | 435 |
| | 6 mos. | 60,714 | — 29,525 |
| Illinois Central | June | — 712,962 | — 312,358 |
| | 6 mos. | — 2,155,474 | — 680,273 |
| Yazoo & Mississippi Valley | June | 252,002 | — 107,282 |
| | 6 mos. | — 972,259 | — 1,100,661 |
| Illinois Terminal | June | — 55,324 | — 22,512 |
| | 6 mos. | — 224,582 | — 229,061 |
| Kansas City Southern | June | — 96,409 | — 76,610 |
| | 6 mos. | — 774,147 | — 547,690 |
| Kansas, Oklahoma & Gulf | June | 6,124 | 38,322 |
| | 6 mos. | 139,583 | 213,442 |
| Lake Superior & Ishpeming | June | 101,066 | 126,457 |
| | 6 mos. | 39,672 | 41,089 |
| Lehigh & Hudson River | June | 16,885 | 14,877 |
| | 6 mos. | 116,352 | 107,646 |
| Lehigh & New England | June | 121,002 | 12,988 |
| | 6 mos. | 327,858 | 235,598 |
| Lehigh Valley | June | 26,820 | — 418,968 |
| | 6 mos. | — 417,234 | — 319,106 |
| Louisiana & Arkansas | June | 26,866 | 17,374 |
| | 6 mos. | 113,705 | 97,882 |
| Louisiana, Arkansas & Texas | June | 11,412 | 4,695 |
| | 6 mos. | — 16,000 | — 18,547 |
| Louisville & Nashville | June | 389,486 | — 123,995 |
| | 6 mos. | 1,465,021 | 2,097,052 |
| Maine Central | June | 32,356 | — 3,517 |
| | 6 mos. | — 28,473 | — 303,639 |
| Midland Valley | June | 41,354 | 43,392 |
| | 6 mos. | — 14,392 | — 9,813 |
| Minneapolis & St. Louis | June | — 320,530 | — 348,666 |
| | 6 mos. | — 1,714,219 | — 1,693,921 |
| Minn., St. Paul & S. S. Marie | June | — 473,408 | — 445,764 |
| | 6 mos. | — 3,480,068 | — 3,061,914 |
| Duluth, South Shore & Atlantic | June | 15,951 | 4,945 |
| | 6 mos. | — 311,874 | — 405,885 |
| Spokane International | June | — 24,229 | — 21,020 |
| | 6 mos. | — 167,830 | — 167,870 |
| Mississippi Central | June | — 749 | — 15,982 |
| | 6 mos. | — 53,173 | — 57,858 |
| Missouri-Arkansas | June | 4,004 | Not applicable |
| | 6 mos. | 25,581 | Not applicable |
| Missouri-Illinois | June | — 7,109 | — 3,772 |
| | 6 mos. | — 31,673 | — 13,988 |
| Missouri-Kansas-Texas Lines | June | — 422,461 | 7,152 |
| | 6 mos. | — 2,704,736 | — 1,422,340 |
| Missouri Pacific | June | — 1,694,975 | — 1,078,658 |
| | 6 mos. | — 8,775,857 | — 6,281,267 |
| International-Great Northern | June | — 278,925 | 2,240 |
| | 6 mos. | — 1,124,516 | — 74,274 |
| San Antonio, Uvalde & Gulf | June | — 79,579 | — 29,670 |
| | 6 mos. | — 247,634 | — 57,697 |
| Mobile & Ohio | June | — 119,544 | — 150,522 |
| | 6 mos. | — 1,004,402 | — 809,740 |
| Monongahela | June | 103,876 | 22,144 |
| | 6 mos. | 239,055 | 226,930 |
| Montour | June | 99,421 | 52,564 |
| | 6 mos. | 400,960 | 319,470 |
| Nash. Chatt. & St. Louis | June | — 113,732 | — 65,655 |
| | 6 mos. | — 476,874 | 46,147 |
| Nevada Northern | June | 4,092 | 6,811 |
| | 6 mos. | 22,932 | 23,521 |
| New York Central | June | — 736,816 | 26,740 |
| | 6 mos. | — 4,160,013 | — 1,613,334 |
| Pittsburgh & Lake Erie | June | 278,055 | 352,769 |
| | 6 mos. | 1,340,521 | 1,505,133 |
| New York, Chicago & St. Louis | June | 5,944 | — 20,433 |
| | 6 mos. | 7,456 | 413,343 |
| N. Y., New Haven & Hartford | June | — 35,052 | — 91,892 |
| | 6 mos. | — 1,613,930 | — 1,424,674 |
| New York Connecting | June | 4,765 | — 6,903 |
| | 6 mos. | 33,949 | 72,659 |
| New York, Ontario & Western | June | 46,387 | — 22,267 |
| | 6 mos. | 65 | 1,329 |
| Norfolk & Western | June | 2,179,039 | 1,861,942 |
| | 6 mos. | 9,934,057 | 10,615,481 |
| Norfolk Southern | June | 122,565 | 171,028 |
| | 6 mos. | — 135,119 | — 71,096 |
| Northern Pacific | June | — 1,134,058 | 1,133,918 |
| | 6 mos. | — 6,504,464 | — 2,478,341 |
| Northwestern Pacific | June | — 104,164 | — 90,322 |
| | 6 mos. | — 921,783 | — 802,200 |
| Oklahoma City-Ada Atoka | June | 48,845 | — 3,673 |
| | 6 mos. | 33,216 | — 35,120 |
| Pennsylvania Railroad | June | 2,279,740 | 2,932,894 |
| | 6 mos. | 9,700,868 | 11,532,478 |
| Long Island | June | 10,721 | 59,701 |
| | 6 mos. | — 881,990 | — 228,753 |
| Pennsylvania-Reading Seashore Lines | June | — 175,550 | — 255,419 |
| | 6 mos. | — 1,640,866 | — 1,644,802 |
| Pere Marquette | June | — 46,010 | 74,497 |
| | 6 mos. | 337,177 | 575,175 |
| Pittsburg & Shawmut | June | — 17,305 | — 9,786 |
| | 6 mos. | — 170,148 | 32,710 |
| Pittsburgh & West Virginia | June | 1,413 | 246 |
| | 6 mos. | 14,673 | 41,009 |
| Pittsburg, Shawmut & Northern | June | 2,193 | — 33,349 |
| | 6 mos. | — 32,611 | — 45,227 |
| Reading | June | 732,975 | 285,248 |
| | 6 mos. | 2,587,038 | 3,775,212 |
| Richmond, Fredericksburg & Potomac | June | 11,563 | 55,751 |
| | 6 mos. | 220,074 | 273,441 |
| Rutland | June | — 35,196 | — 21,377 |
| | 6 mos. | — 267,928 | — 186,554 |
| St. Louis-San Francisco | June | — 1,248,995 | — 657,678 |
| | 6 mos. | — 6,416,747 | — 4,394,934 |
| Ft. Worth & Rio Grande | June | — 16,601 | — 17,891 |
| | 6 mos. | — 141,828 | — 147,620 |
| St. Louis, San Francisco & Texas | June | — 70,665 | — 48,836 |
| | 6 mos. | — 343,879 | — 304,516 |
| St. Louis Southwestern Lines | June | — 102,529 | 17,947 |
| | 6 mos. | — 299,298 | — 444,272 |
| San Diego & Arizona Eastern | June | 2,141 | 1,751 |
| | 6 mos. | — 52,365 | — 8,700 |
| Seaboard Air Line | June | — 862,182 | — 835,131 |
| | 6 mos. | — 3,197,630 | — 2,991,082 |
| Southern Railway | June | — 398,803 | — 643,471 |
| | 6 mos. | — 2,545,610 | — 1,168,339 |
| Alabama Great Southern | June | 124,720 | 149,697 |
| | 6 mos. | — 33,167 | 245,687 |
| Cinn., New Orleans & Texas Pacific | June | 171,054 | 122,491 |
| | 6 mos. | 699,352 | 982,987 |
| Georgia Southern & Florida | June | — 12,875 | — 39,662 |
| | 6 mos. | — 143,910 | — 91,395 |
| New Orleans & Northeastern | June | — 16,819 | — 30,829 |
| | 6 mos. | — 139,081 | — 149,738 |
| Northern Alabama | June | — 490 | — 11,402 |
| | 6 mos. | — 44,654 | — 38,037 |
| Southern Pacific Transportation | June | 108,190 | 1,622,625 |
| | 6 mos. | — 3,330,967 | — 2,506,477 |
| Spokane, Portland & Seattle | June | — 155,445 | — 99,658 |
| | 6 mos. | — 1,100,679 | — 1,057,675 |
| Tennessee Central | June | — 79 | — 8,186 |
| | 6 mos. | 25,779 | 23,057 |
| Texas & Pacific | June | 63,165 | 129,412 |
| | 6 mos. | 106,606 | 295,679 |
| Texas Mexican | June | — 16,292 | — 25,785 |
| | 6 mos. | 66,839 | — 26,614 |
| Toledo, Peoria & Western | June | — 5,686 | 1,910 |
| | 6 mos. | 10,905 | 5,901 |
| Union Pacific | June | 1,777,858 | 2,430,143 |
| | 6 mos. | 6,146,075 | 8,367,969 |
| Oregon Short Line | June | — 148,908 | — 206,710 |
| | 6 mos. | — 343,724 | — 209,102 |
| Oregon-Washington R.R. & Nav. Co. | June | — 431,481 | — 406,339 |
| | 6 mos. | — 2,148,592 | — 1,847,722 |
| Los Angeles & Salt Lake | June | 44,050 | 172,565 |
| | 6 mos. | — 191,375 | 162,158 |
| St. Joseph & Grand Island | June | 41,294 | 5,012 |
| | 6 mos. | 131,925 | 263,987 |
| Utah | June | — 9,915 | — 38,166 |
| | 6 mos. | — 83,187 | — 182,852 |
| Virginian | June | 425,841 | 193,128 |
| | 6 mos. | 1,796,016 | 1,520,596 |
| Wabash | June | 591,331 | — 334,806 |
| | 6 mos. | — 1,588,022 | — 1,401,744 |
| Ann Arbor | June | 1,636 | 5,680 |
| | 6 mos. | 13,624 | — 20,047 |
| Western Maryland | June | 63,028 | 25,916 |
| | 6 mos. | 436,037 | 537,936 |
| Western Pacific | June | — 265,568 | — 170,057 |
| | 6 mos. | — 1,427,371 | — 1,040,971 |
| Wheeling & Lake Erie | June | 202,821 | 168,779 |
| | 6 mos. | 654,702 | 751,643 |
| Wichita Falls & Southern | June | 3,699 | 1,623 |
| | 6 mos. | — 46,124 | — 33,137 |

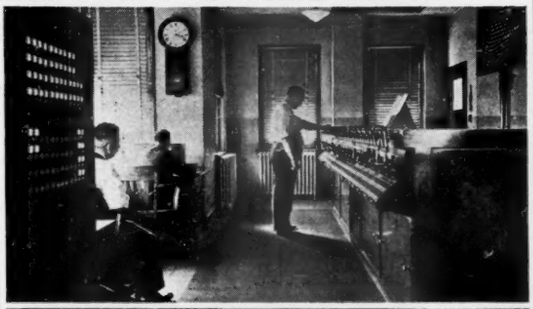
*Table of Operating Statistics of Railways begins on next left-hand page*

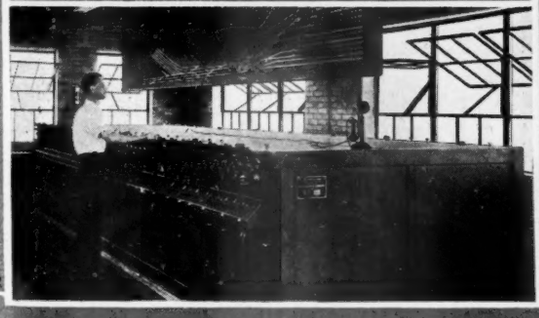


# EXPEDITE TO-DAY'S INCREASED TRAFFIC









WHEN traffic conditions demand increased interlocking facilities, install the modern type "Union" Power Interlocking machines. They are built to give a long life of efficient expedited service, free from petty maintenance problems. "Union" Power Interlocking machines are still efficiently functioning after many years of reliable service, the oldest of which has been in service over 44 years. Others have given 28 and 30 years service and are still good for many more. » »

Whether it be a large terminal or isolated small outlying interlocking, "Union" Power Interlockings will assure a long life of economical and efficient service. » » » » » » »

Our nearest district office will be glad to furnish details. » » » » » » »

**A FEW "UNION" POWER INTERLOCKING FEATURES:**

1. **Simplicity**
2. **Sturdy construction**
3. **Economy**
4. **Long life**
5. **Reliability**
6. **Compactness; saves tower space because many functions may be operated from one lever.**

**Union Switch & Signal Co.**

SWISSVALE, PA.

NEW YORK MONTREAL CHICAGO ST. LOUIS SAN FRANCISCO

# Freight Operating Statistics of Large Steam Railways—Selected Items for the Month of June,

| Region, road, and year | Average miles of road operated | Train-miles | Locomotive-miles: Principal and helper | Locomotive-miles: Light | Car-miles: Loaded (thousands) | Car-miles: Per cent loaded | Ton-miles (thousands): Gross Excluding locomotives and tenders | Ton-miles (thousands): Net Revenue and non-revenue | Average number of locomotives on line: Serviceable | Unserviceable | Per cent unserviceable | Stored |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **New England Region:** | | | | | | | | | | | | |
| Boston & Albany | 1935 | 373 | 113,440 | 117,540 | 7,850 | 2,864 | 67.0 | 149,576 | 50,335 | 59 | 37 | 38.9 | 17 |
| | 1934 | 402 | 124,020 | 128,508 | 8,606 | 3,154 | 66.1 | 165,658 | 54,601 | 64 | 37 | 36.3 | 14 |
| Boston & Maine | 1935 | 1,986 | 249,761 | 279,409 | 28,101 | 8,930 | 70.9 | 476,450 | 184,688 | 98 | 127 | 56.4 | 6 |
| | 1934 | 2,016 | 254,048 | 283,046 | 26,605 | 8,558 | 67.4 | 465,638 | 170,693 | 132 | 142 | 51.9 | 22 |
| N. Y., New Hav. & Hart. | 1935 | 2,050 | 336,203 | 409,688 | 19,852 | 11,121 | 65.3 | 610,331 | 225,330 | 191 | 109 | 36.4 | 14 |
| | 1934 | 2,044 | 347,372 | 422,487 | 19,275 | 10,802 | 63.2 | 597,649 | 211,783 | 205 | 147 | 41.8 | 18 |
| **Great Lakes Region:** | | | | | | | | | | | | | |
| Delaware & Hudson | 1935 | 835 | 208,939 | 284,713 | 31,824 | 7,325 | 64.5 | 452,970 | 213,503 | 245 | 29 | 10.6 | 147 |
| | 1934 | 848 | 199,826 | 265,577 | 30,598 | 6,548 | 61.1 | 410,669 | 183,607 | 244 | 32 | 11.5 | 146 |
| Del., Lack. & Western | 1935 | 992 | 324,684 | 365,183 | 48,142 | 10,798 | 66.5 | 638,972 | 261,316 | 162 | 88 | 35.1 | 45 |
| | 1934 | 992 | 359,906 | 397,147 | 49,887 | 11,275 | 63.4 | 656,869 | 251,795 | 174 | 79 | 31.3 | 33 |
| Erie (incl. Chi. & Erie) | 1935 | 2,305 | 648,761 | 684,281 | 46,901 | 27,059 | 64.8 | 1,664,905 | 636,309 | 293 | 184 | 38.5 | 74 |
| | 1934 | 2,315 | 680,605 | 714,222 | 60,210 | 28,508 | 61.9 | 1,766,995 | 629,867 | 317 | 170 | 34.9 | 69 |
| Grand Trunk Western | 1935 | 1,007 | 220,753 | 223,237 | 1,827 | 6,276 | 62.6 | 374,259 | 128,462 | 72 | 69 | 49.2 | .. |
| | 1934 | 1,007 | 211,306 | 213,970 | 1,932 | 5,585 | 59.6 | 341,038 | 111,818 | 69 | 81 | 53.9 | 1 |
| Lehigh Valley | 1935 | 1,335 | 356,451 | 381,866 | 39,995 | 11,678 | 65.9 | 732,378 | 309,336 | 150 | 158 | 51.3 | 8 |
| | 1934 | 1,335 | 380,589 | 399,481 | 37,788 | 11,586 | 62.9 | 708,551 | 271,196 | 188 | 127 | 40.2 | 16 |
| New York Central | 1935 | 10,919 | 2,284,256 | 2,405,917 | 142,712 | 77,746 | 61.0 | 4,946,710 | 2,042,274 | 903 | 621 | 40.7 | 169 |
| | 1934 | 10,936 | 2,321,081 | 2,421,274 | 140,974 | 77,439 | 60.1 | 4,859,873 | 1,925,718 | 913 | 671 | 42.4 | 154 |
| N. Y., Chi. & St. Louis | 1935 | 1,661 | 398,494 | 401,569 | 4,696 | 13,867 | 64.8 | 809,903 | 294,519 | 138 | 40 | 22.3 | 53 |
| | 1934 | 1,661 | 483,189 | 488,789 | 4,468 | 14,849 | 60.7 | 895,794 | 305,483 | 127 | 46 | 26.8 | 20 |
| Pere Marquette | 1935 | 2,096 | 306,709 | 323,208 | 2,764 | 7,928 | 62.3 | 498,090 | 193,059 | 110 | 43 | 28.3 | 6 |
| | 1934 | 2,108 | 324,292 | 334,971 | 2,743 | 7,657 | 58.6 | 488,521 | 177,068 | 112 | 39 | 25.8 | 13 |
| Pittsburgh & Lake Erie | 1935 | 234 | 69,285 | 70,632 | 26 | 2,850 | 58.2 | 248,831 | 139,849 | 34 | 37 | 52.0 | 10 |
| | 1934 | 234 | 74,099 | 75,830 | 64 | 3,029 | 58.4 | 262,891 | 146,936 | 36 | 36 | 50.1 | 9 |
| Wabash | 1935 | 2,435 | 496,432 | 502,514 | 10,193 | 15,400 | 64.5 | 882,442 | 289,189 | 162 | 170 | 51.3 | 36 |
| | 1934 | 2,445 | 514,352 | 521,834 | 10,808 | 15,829 | 61.5 | 933,193 | 292,574 | 157 | 177 | 53.1 | 44 |
| **Central Eastern Region:** | | | | | | | | | | | | | |
| Baltimore & Ohio | 1935 | 6,321 | 1,253,638 | 1,535,007 | 175,741 | 38,777 | 62.8 | 2,613,520 | 1,182,898 | 744 | 566 | 43.2 | 138 |
| | 1934 | 6,263 | 1,347,649 | 1,630,881 | 184,210 | 40,316 | 60.9 | 2,747,365 | 1,218,318 | 757 | 549 | 42.0 | 115 |
| Central of New Jersey | 1935 | 684 | 141,139 | 161,124 | 30,818 | 5,030 | 60.5 | 355,677 | 176,659 | 69 | 87 | 55.8 | 13 |
| | 1934 | 690 | 133,747 | 151,953 | 29,088 | 4,464 | 57.2 | 313,908 | 145,663 | 79 | 93 | 54.1 | 21 |
| Chicago & Eastern Ill. | 1935 | 939 | 149,799 | 150,287 | 2,427 | 3,520 | 66.2 | 215,786 | 91,963 | 49 | 60 | 54.9 | 5 |
| | 1934 | 939 | 164,072 | 164,174 | 2,764 | 3,705 | 64.6 | 228,979 | 95,027 | 52 | 116 | 68.9 | 8 |
| Elgin, Joliet & Eastern | 1935 | 446 | 83,911 | 85,462 | 713 | 1,988 | 61.5 | 152,875 | 75,886 | 52 | 35 | 40.5 | 2 |
| | 1934 | 446 | 81,118 | 81,684 | 712 | 1,980 | 59.9 | 166,714 | 74,745 | 60 | 29 | 32.9 | 11 |
| Long Island | 1935 | 393 | 26,931 | 27,589 | 14,367 | 264 | 53.8 | 19,491 | 7,692 | 31 | 21 | 40.4 | .. |
| | 1934 | 396 | 27,203 | 27,800 | 13,803 | 256 | 52.6 | 19,015 | 7,359 | 29 | 26 | 47.6 | .. |
| Pennsylvania System | 1935 | 10,009 | 2,640,632 | 2,998,409 | 331,993 | 97,110 | 63.3 | 6,497,172 | 2,929,990 | 1,373 | 1,074 | 43.9 | 233 |
| | 1934 | 10,088 | 2,662,361 | 2,959,036 | 320,389 | 92,277 | 61.3 | 6,235,999 | 2,704,955 | 1,483 | 921 | 38.3 | 315 |
| Reading | 1935 | 1,452 | 399,203 | 435,293 | 50,490 | 11,582 | 60.1 | 860,461 | 421,694 | 267 | 101 | 27.6 | 81 |
| | 1934 | 1,454 | 378,793 | 411,766 | 42,044 | 10,343 | 58.2 | 746,727 | 342,910 | 263 | 118 | 31.0 | 76 |
| **Pocahontas Region:** | | | | | | | | | | | | | |
| Chesapeake & Ohio | 1935 | 3,050 | 806,634 | 850,827 | 36,641 | 36,854 | 56.8 | 3,070,038 | 1,662,598 | 408 | 94 | 18.7 | 98 |
| | 1934 | 3,076 | 820,027 | 862,969 | 33,841 | 36,450 | 56.4 | 3,059,964 | 1,650,910 | 443 | 103 | 18.9 | 115 |
| Norfolk & Western | 1935 | 2,145 | 611,926 | 640,643 | 28,186 | 24,913 | 59.8 | 2,094,847 | 1,100,736 | 336 | 50 | 13.1 | 102 |
| | 1934 | 2,164 | 595,242 | 621,557 | 26,389 | 23,278 | 59.5 | 1,903,507 | 982,103 | 411 | 54 | 11.6 | 172 |
| **Southern Region:** | | | | | | | | | | | | | |
| Atlantic Coast Line | 1935 | 5,148 | 566,663 | 570,134 | 7,468 | 11,957 | 63.5 | 626,693 | 212,637 | 300 | 126 | 29.7 | 50 |
| | 1934 | 5,145 | 583,854 | 588,574 | 7,262 | 11,220 | 62.5 | 603,876 | 209,670 | 319 | 128 | 28.6 | 76 |
| Central of Georgia | 1935 | 1,886 | 228,612 | 229,615 | 4,129 | 5,058 | 67.9 | 277,239 | 103,565 | 96 | 45 | 32.0 | .. |
| | 1934 | 1,886 | 211,076 | 212,708 | 3,034 | 4,596 | 66.9 | 252,557 | 93,889 | 100 | 41 | 29.1 | .. |
| Illinois Central (incl. Y. & M. V.) | 1935 | 6,587 | 1,370,658 | 1,381,789 | 27,091 | 33,065 | 63.8 | 2,045,729 | 823,362 | 627 | 273 | 30.4 | 8 |
| | 1934 | 6,617 | 1,421,242 | 1,442,119 | 27,597 | 31,474 | 59.1 | 1,988,603 | 730,951 | 604 | 323 | 34.8 | 23 |
| Louisville & Nashville | 1935 | 5,046 | 951,780 | 1,028,058 | 26,096 | 21,884 | 61.0 | 1,501,081 | 711,883 | 319 | 267 | 45.6 | 9 |
| | 1934 | 5,062 | 963,937 | 1,033,519 | 21,007 | 21,149 | 59.2 | 1,447,918 | 657,770 | 323 | 295 | 47.7 | 11 |
| Seaboard Air Line | 1935 | 4,295 | 410,722 | 414,897 | 4,110 | 9,708 | 64.5 | 547,894 | 196,163 | 176 | 102 | 36.7 | 10 |
| | 1934 | 4,296 | 426,540 | 435,645 | 3,347 | 9,641 | 66.0 | 542,511 | 204,375 | 199 | 84 | 29.7 | 11 |
| Southern | 1935 | 6,599 | 1,086,697 | 1,099,949 | 18,439 | 24,632 | 68.5 | 1,305,582 | 490,065 | 532 | 276 | 34.2 | 55 |
| | 1934 | 6,599 | 1,051,538 | 1,063,858 | 18,249 | 22,769 | 65.5 | 1,226,493 | 438,843 | 618 | 289 | 31.9 | 108 |
| **Northwestern Region:** | | | | | | | | | | | | | |
| Chi. & North Western | 1935 | 8,428 | 857,482 | 910,146 | 23,092 | 22,247 | 65.1 | 1,344,249 | 478,311 | 507 | 251 | 33.1 | 85 |
| | 1934 | 8,443 | 935,584 | 980,302 | 22,870 | 24,110 | 62.9 | 1,445,679 | 507,331 | 574 | 235 | 29.0 | 151 |
| Chicago Great Western | 1935 | 1,456 | 210,244 | 210,330 | 6,428 | 6,041 | 61.0 | 370,028 | 130,793 | 61 | 38 | 38.0 | 5 |
| | 1934 | 1,463 | 201,778 | 202,387 | 14,964 | 6,528 | 60.9 | 389,101 | 130,359 | 62 | 36 | 36.3 | 2 |
| Chi., Milw., St. P. & Pac. | 1935 | 11,119 | 1,114,535 | 1,178,085 | 51,399 | 29,274 | 61.1 | 1,842,603 | 723,469 | 466 | 186 | 28.5 | 99 |
| | 1934 | 11,157 | 1,134,121 | 1,194,411 | 54,660 | 29,475 | 61.2 | 1,782,159 | 658,248 | 537 | 343 | 39.0 | 185 |
| Chi., St. P., Minneap. & Omaha | 1935 | 1,641 | 177,908 | 181,874 | 8,219 | 3,882 | 69.3 | 222,504 | 87,246 | 102 | 40 | 28.0 | 42 |
| | 1934 | 1,653 | 192,020 | 198,377 | 7,583 | 4,103 | 66.6 | 238,459 | 94,592 | 115 | 37 | 24.5 | 55 |
| Great Northern | 1935 | 8,254 | 610,690 | 614,168 | 14,182 | 19,826 | 63.8 | 1,306,424 | 602,974 | 414 | 186 | 31.0 | 85 |
| | 1934 | 8,335 | 701,795 | 706,363 | 21,055 | 21,863 | 62.3 | 1,446,580 | 636,217 | 428 | 169 | 28.3 | 98 |
| Minneap., St. P. & Sault St. Marie | 1935 | 4,274 | 325,632 | 328,947 | 2,126 | 7,508 | 69.7 | 412,037 | 175,170 | 116 | 35 | 23.3 | .. |
| | 1934 | 4,280 | 328,007 | 332,748 | 2,691 | 7,201 | 64.8 | 414,771 | 172,156 | 119 | 42 | 26.0 | 5 |
| Northern Pacific | 1935 | 6,416 | 532,776 | 578,614 | 36,729 | 15,215 | 66.7 | 901,659 | 350,177 | 338 | 111 | 24.7 | 11 |
| | 1934 | 6,410 | 650,566 | 709,978 | 46,493 | 17,744 | 65.6 | 1,077,068 | 406,953 | 345 | 170 | 33.0 | 43 |
| Oreg.-Wash. R. R. & Nav. | 1935 | 2,094 | 153,163 | 159,275 | 9,100 | 3,570 | 69.6 | 199,216 | 74,927 | 84 | 37 | 30.4 | 17 |
| | 1934 | 2,139 | 147,163 | 152,976 | 9,923 | 3,472 | 65.8 | 197,376 | 71,573 | 80 | 43 | 34.9 | 16 |
| **Central Western Region:** | | | | | | | | | | | | | |
| Alton | 1935 | 921 | 187,386 | 190,010 | 1,759 | 3,998 | 58.7 | 262,574 | 87,735 | 47 | 45 | 49.3 | .. |
| | 1934 | 923 | 198,181 | 205,150 | 918 | 4,132 | 58.8 | 268,635 | 87,916 | 47 | 47 | 50.4 | .. |
| Atch., Top. & S. Fe (incl. G.C. & S.F. & P. & S.F.) | 1935 | 13,308 | 1,585,705 | 1,673,645 | 67,965 | 44,048 | 63.5 | 2,661,344 | 858,927 | 620 | 371 | 37.4 | 124 |
| | 1934 | 13,316 | 1,606,284 | 1,701,456 | 68,928 | 46,156 | 62.5 | 2,868,498 | 982,958 | 671 | 364 | 35.2 | 163 |
| Chicago, Burl. & Quincy | 1935 | 8,971 | 1,046,891 | 1,103,333 | 40,015 | 27,188 | 64.5 | 1,591,790 | 686,429 | 444 | 95 | 17.6 | 13 |
| | 1934 | 9,096 | 1,102,423 | 1,151,470 | 36,639 | 27,768 | 61.9 | 1,626,496 | 662,891 | 455 | 107 | 19.0 | 7 |
| Chi., Rock I. & Pac. (incl. Chi., Rock I. & Gulf) | 1935 | 8,297 | 955,182 | 973,443 | 5,907 | 22,059 | 61.5 | 1,327,957 | 471,669 | 357 | 272 | 43.2 | 24 |
| | 1934 | 8,316 | 1,062,162 | 1,084,975 | 8,433 | 24,384 | 60.3 | 1,496,738 | 536,226 | 443 | 146 | 24.8 | 96 |
| Denver & Rio Gr. Wstrn. | 1935 | 2,584 | 196,637 | 212,779 | 22,568 | 5,360 | 68.5 | 315,124 | 132,297 | 162 | 49 | 23.2 | 23 |
| | 1934 | 2,558 | 189,902 | 205,718 | 20,120 | 5,503 | 69.7 | 314,911 | 130,275 | 172 | 62 | 26.5 | 28 |
| Los Angeles & Salt Lake | 1935 | 1,225 | 148,127 | 168,123 | 23,288 | 4,452 | 66.9 | 257,809 | 93,177 | 73 | 19 | 20.1 | 4 |
| | 1934 | 1,232 | 167,935 | 193,962 | 30,940 | 4,766 | 62.1 | 296,822 | 111,411 | 70 | 24 | 25.7 | 3 |
| Oregon Short Line | 1935 | 2,484 | 251,281 | 257,961 | 12,347 | 6,199 | 63.3 | 369,763 | 139,060 | 118 | 54 | 31.2 | 26 |
| | 1934 | 2,463 | 221,231 | 229,334 | 13,808 | 5,361 | 62.8 | 318,184 | 115,966 | 124 | 56 | 31.1 | 32 |
| Southern Pacific—Pacific Lines | 1935 | 8,599 | 1,169,675 | 1,266,076 | 138,727 | 39,379 | 61.5 | 2,480,424 | 779,433 | 516 | 261 | 33.6 | 123 |
| | 1934 | 8,607 | 1,254,806 | 1,367,037 | 159,730 | 42,399 | 61.6 | 2,657,520 | 858,918 | 541 | 304 | 36.0 | 117 |
| Union Pacific | 1935 | 3,590 | 818,894 | 838,404 | 35,283 | 28,976 | 66.8 | 1,671,707 | 604,776 | 267 | 122 | 31.3 | 48 |
| | 1934 | 3,768 | 768,777 | 788,519 | 34,514 | 26,435 | 60.4 | 1,616,034 | 529,727 | 296 | 122 | 29.2 | 89 |
| **Southwestern Region:** | | | | | | | | | | | | | |
| Mo.-Kans.-Texas Lines | 1935 | 3,282 | 355,368 | 359,051 | 5,304 | 9,265 | 61.1 | 562,553 | 191,221 | 108 | 86 | 44.3 | 24 |
| | 1934 | 3,282 | 369,561 | 372,984 | 4,396 | 10,174 | 61.7 | 606,441 | 200,857 | 154 | 72 | 31.7 | 67 |
| Missouri Pacific | 1935 | 7,208 | 1,017,328 | 1,052,022 | 22,309 | 27,314 | 63.5 | 1,681,508 | 631,980 | 379 | 160 | 29.6 | 120 |
| | 1934 | 7,330 | 1,046,047 | 1,087,002 | 23,977 | 28,775 | 61.7 | 1,787,274 | 658,996 | 410 | 143 | 25.9 | 147 |
| St. Louis-San Francisco | 1935 | 4,993 | 632,297 | 641,686 | 8,260 | 13,271 | 63.2 | 793,463 | 306,640 | 364 | 81 | 18.2 | 118 |
| | 1934 | 5,082 | 630,087 | 635,832 | 9,761 | 13,811 | 61.2 | 851,760 | 327,015 | 400 | 74 | 15.6 | 139 |
| St. Louis Southwestern Lines | 1935 | 1,774 | 264,781 | 269,708 | 3,594 | 6,733 | 59.1 | 405,568 | 121,052 | 91 | 28 | 23.6 | 10 |
| | 1934 | 1,798 | 267,985 | 275,759 | 3,542 | 7,281 | 60.4 | 428,173 | 125,261 | 93 | 37 | 28.5 | 6 |
| Texas & New Orleans | 1935 | 4,420 | 481,954 | 482,535 | 8,148 | 10,844 | 60.1 | 672,259 | 220,885 | 225 | 68 | 23.3 | 55 |
| | 1934 | 4,462 | 506,474 | 506,605 | 4,851 | 11,474 | 59.5 | 714,980 | 237,794 | 226 | 76 | 25.1 | 53 |
| Texas & Pacific | 1935 | 1,945 | 275,026 | 275,026 | 1,563 | 8,054 | 57.2 | 516,663 | 154,931 | 150 | 71 | 32.1 | 76 |
| | 1934 | 1,946 | 259,304 | 259,304 | 1,513 | 7,748 | 58.4 | 493,564 | 151,663 | 157 | 79 | 33.3 | 89 |

*Compiled by the Bureau of Statistics, Interstate Commerce Commission. Subject to revision.*

# 1935, Compared with June, 1934, for Roads with Annual Operating Revenues Above $25,000,000

| Region, road, and year | Average number of freight cars on line: Home | Foreign | Total | Per cent unserviceable | Gross ton-miles per train-hour, excluding locomotives and tenders | Gross ton-miles per train-mile, excluding locomotives and tenders | Net ton-miles per train-mile | Net ton-miles per loaded car-mile | Net ton-miles per car-day | Car-miles per car-day | Net ton-miles per mile of road per day | Pounds of coal per 1,000 gross ton-miles, including locomotives and tenders | Locomotive-miles per locomotive-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **New England Region:** | | | | | | | | | | | | | |
| Boston & Albany 1935 | 2,838 | 4,443 | 7,281 | 23.7 | 22,003 | 1,319 | 444 | 17.6 | 230 | 19.6 | 4,496 | 155 | 43.6 |
| 1934 | 2,968 | 3,402 | 6,370 | 24.8 | 22,153 | 1,336 | 440 | 17.3 | 286 | 25.0 | 4,531 | 145 | 45.5 |
| Boston & Maine 1935 | 8,584 | 7,849 | 16,433 | 13.8 | 26,278 | 1,908 | 739 | 20.7 | 375 | 25.6 | 3,099 | 100 | 45.5 |
| 1934 | 8,924 | 6,571 | 15,495 | 15.3 | 25,457 | 1,833 | 672 | 19.9 | 367 | 27.3 | 2,823 | 99 | 37.7 |
| N. Y., New Hav. & Hart. 1935 | 14,495 | 11,383 | 25,878 | 15.3 | 26,374 | 1,815 | 670 | 20.3 | 290 | 21.9 | 3,664 | 98 | 47.8 |
| 1934 | 15,571 | 10,118 | 25,689 | 12.1 | 26,110 | 1,720 | 610 | 19.6 | 275 | 22.2 | 3,453 | 103 | 41.9 |
| **Great Lakes Region:** | | | | | | | | | | | | | |
| Delaware & Hudson 1935 | 10,286 | 2,941 | 13,227 | 4.9 | 29,311 | 2,168 | 1,022 | 29.1 | 538 | 28.6 | 8,520 | 105 | 38.4 |
| 1934 | 11,447 | 2,717 | 14,164 | 4.5 | 27,385 | 2,055 | 919 | 28.0 | 432 | 25.2 | 7,215 | 107 | 35.9 |
| Del., Lack. & Western 1935 | 15,500 | 6,707 | 22,207 | 11.2 | 31,393 | 1,968 | 805 | 24.2 | 392 | 24.4 | 8,782 | 124 | 55.1 |
| 1934 | 16,550 | 4,621 | 21,171 | 12.0 | 28,382 | 1,825 | 700 | 22.3 | 396 | 28.0 | 8,462 | 134 | 58.9 |
| Erie (incl. Chi. & Erie) 1935 | 22,934 | 11,398 | 34,332 | 6.7 | 43,461 | 2,566 | 981 | 23.5 | 618 | 40.5 | 9,202 | 90 | 51.1 |
| 1934 | 24,680 | 14,923 | 39,603 | 6.6 | 43,218 | 2,596 | 925 | 22.1 | 530 | 38.8 | 9,068 | 90 | 53.0 |
| Grand Trunk Western 1935 | 4,517 | 7,425 | 11,942 | 17.2 | 32,253 | 1,695 | 582 | 20.5 | 359 | 28.0 | 4,254 | 89 | 53.1 |
| 1934 | 5,039 | 7,320 | 12,359 | 13.8 | 31,423 | 1,614 | 529 | 20.0 | 302 | 25.3 | 3,703 | 91 | 47.9 |
| Lehigh Valley 1935 | 13,458 | 6,640 | 20,098 | 11.7 | 35,119 | 2,055 | 868 | 26.5 | 513 | 29.4 | 7,722 | 126 | 45.7 |
| 1934 | 18,024 | 6,201 | 24,225 | 19.4 | 32,931 | 1,862 | 713 | 23.4 | 373 | 25.3 | 6,773 | 126 | 46.3 |
| New York Central 1935 | 123,533 | 61,948 | 185,481 | 18.8 | 36,884 | 2,166 | 894 | 26.3 | 367 | 22.9 | 6,235 | 95 | 55.7 |
| 1934 | 138,434 | 55,046 | 193,480 | 19.1 | 35,811 | 2,094 | 830 | 24.9 | 332 | 22.2 | 5,870 | 97 | 53.9 |
| N. Y., Chi. & St. Louis 1935 | 8,490 | 6,652 | 15,142 | 4.2 | 37,418 | 2,032 | 739 | 21.2 | 648 | 47.1 | 5,912 | 84 | 75.9 |
| 1934 | 8,698 | 6,723 | 15,421 | 4.7 | 34,032 | 1,854 | 632 | 20.6 | 660 | 52.8 | 6,132 | 89 | 95.0 |
| Pere Marquette 1935 | 10,424 | 4,765 | 15,189 | 4.5 | 27,900 | 1,624 | 629 | 24.4 | 424 | 27.9 | 3,071 | 87 | 70.9 |
| 1934 | 11,212 | 4,681 | 15,893 | 3.4 | 25,301 | 1,506 | 546 | 23.1 | 371 | 27.4 | 2,800 | 89 | 74.6 |
| Pittsburgh & Lake Erie 1935 | 15,588 | 11,369 | 26,957 | 44.7 | 52,585 | 3,591 | 2,018 | 49.1 | 173 | 6.1 | 19,949 | 87 | 33.0 |
| 1934 | 16,353 | 11,315 | 27,668 | 35.6 | 50,790 | 3,548 | 1,983 | 48.5 | 177 | 6.3 | 20,960 | 89 | 35.1 |
| Wabash 1935 | 13,324 | 8,230 | 21,554 | 3.5 | 36,504 | 1,778 | 583 | 18.8 | 447 | 36.9 | 3,960 | 104 | 51.5 |
| 1934 | 14,071 | 8,495 | 22,566 | 3.5 | 36,691 | 1,814 | 569 | 18.5 | 432 | 38.0 | 3,989 | 101 | 53.2 |
| **Central Eastern Region:** | | | | | | | | | | | | | |
| Baltimore & Ohio 1935 | 75,326 | 20,318 | 95,644 | 18.7 | 27,836 | 2,085 | 944 | 30.5 | 412 | 21.5 | 6,238 | 138 | 43.5 |
| 1934 | 81,440 | 19,856 | 101,296 | 17.9 | 27,092 | 2,039 | 904 | 30.2 | 401 | 21.8 | 6,484 | 136 | 46.3 |
| Central of New Jersey 1935 | 12,607 | 9,860 | 22,467 | 28.0 | 30,570 | 2,520 | 1,252 | 35.1 | 262 | 12.3 | 8,609 | 123 | 40.9 |
| 1934 | 16,450 | 7,131 | 23,581 | 33.5 | 28,255 | 2,347 | 1,089 | 32.6 | 206 | 11.0 | 7,038 | 134 | 35.1 |
| Chicago & Eastern Ill. 1935 | 3,508 | 2,399 | 5,907 | 11.3 | 26,869 | 1,441 | 614 | 26.1 | 519 | 30.0 | 3,265 | 121 | 46.8 |
| 1934 | 5,953 | 2,291 | 8,244 | 28.2 | 25,524 | 1,396 | 579 | 25.6 | 384 | 23.2 | 3,374 | 114 | 33.0 |
| Elgin, Joliet & Eastern 1935 | 7,878 | 2,847 | 10,725 | 6.3 | 18,439 | 1,822 | 904 | 38.2 | 236 | 10.0 | 5,670 | 110 | 33.0 |
| 1934 | 8,849 | 5,286 | 14,135 | 16.0 | 19,510 | 2,055 | 921 | 37.8 | 176 | 7.8 | 5,585 | 98 | 30.9 |
| Long Island 1935 | 777 | 2,894 | 3,671 | 3.7 | 5,645 | 724 | 286 | 29.1 | 70 | 4.5 | 653 | 303 | 26.9 |
| 1934 | 785 | 2,864 | 3,649 | 2.2 | 5,157 | 699 | 271 | 28.7 | 67 | 4.4 | 619 | 298 | 25.2 |
| Pennsylvania System 1935 | 238,376 | 51,849 | 290,225 | 15.2 | 35,492 | 2,460 | 1,110 | 30.2 | 337 | 17.6 | 9,758 | 108 | 45.4 |
| 1934 | 246,703 | 48,709 | 295,412 | 12.7 | 33,899 | 2,342 | 1,016 | 29.3 | 305 | 17.0 | 8,938 | 113 | 45.5 |
| Reading 1935 | 28,182 | 9,047 | 37,229 | 8.8 | 27,855 | 2,155 | 1,056 | 36.4 | 378 | 17.3 | 9,683 | 131 | 44.0 |
| 1934 | 35,041 | 7,833 | 42,874 | 12.3 | 24,932 | 1,971 | 905 | 33.2 | 267 | 13.8 | 7,863 | 144 | 39.7 |
| **Pocahontas Region:** | | | | | | | | | | | | | |
| Chesapeake & Ohio 1935 | 39,507 | 11,588 | 51,095 | 2.2 | 55,123 | 3,806 | 2,061 | 45.1 | 1,085 | 42.3 | 18,170 | 69 | 58.9 |
| 1934 | 42,233 | 12,053 | 54,286 | 1.7 | 53,244 | 3,732 | 2,013 | 45.3 | 1,014 | 39.7 | 17,888 | 69 | 54.8 |
| Norfolk & Western 1935 | 32,221 | 4,496 | 36,717 | 2.8 | 52,258 | 3,423 | 1,799 | 44.2 | 999 | 37.8 | 17,102 | 92 | 57.8 |
| 1934 | 36,238 | 4,495 | 40,733 | 3.8 | 48,757 | 3,198 | 1,650 | 42.2 | 804 | 32.0 | 15,128 | 97 | 46.5 |
| **Southern Region:** | | | | | | | | | | | | | |
| Atlantic Coast Line 1935 | 22,107 | 6,960 | 29,067 | 18.7 | 20,016 | 1,106 | 375 | 17.8 | 244 | 21.6 | 1,377 | 112 | 45.2 |
| 1934 | 25,003 | 4,742 | 29,745 | 24.3 | 18,717 | 1,034 | 359 | 18.7 | 235 | 20.1 | 1,358 | 117 | 44.4 |
| Central of Georgia 1935 | 5,709 | 4,258 | 9,967 | 18.7 | 22,450 | 1,213 | 453 | 20.5 | 346 | 24.9 | 1,831 | 117 | 55.3 |
| 1934 | 7,000 | 2,544 | 9,544 | 23.5 | 21,438 | 1,197 | 445 | 20.4 | 328 | 24.0 | 1,660 | 120 | 51.0 |
| Illinois Central (incl. Y. & M. V.) 1935 | 42,288 | 15,810 | 58,098 | 35.1 | 26,273 | 1,493 | 601 | 24.9 | 472 | 29.7 | 4,167 | 124 | 52.2 |
| 1934 | 53,875 | 14,493 | 68,368 | 40.0 | 24,828 | 1,399 | 514 | 23.2 | 356 | 26.0 | 3,682 | 128 | 52.8 |
| Louisville & Nashville 1935 | 39,468 | 7,724 | 47,192 | 27.7 | 25,433 | 1,577 | 748 | 32.5 | 503 | 25.3 | 4,702 | 127 | 60.0 |
| 1934 | 48,782 | 8,296 | 57,078 | 30.7 | 23,860 | 1,502 | 682 | 31.1 | 384 | 20.9 | 4,332 | 130 | 56.9 |
| Seaboard Air Line 1935 | 9,977 | 4,598 | 14,575 | 4.2 | 22,552 | 1,334 | 478 | 20.2 | 449 | 34.4 | 1,522 | 112 | 50.2 |
| 1934 | 10,808 | 4,347 | 15,155 | 6.9 | 21,055 | 1,272 | 479 | 21.2 | 450 | 32.1 | 1,586 | 115 | 51.7 |
| Southern 1935 | 24,931 | 13,718 | 38,649 | 12.7 | 21,267 | 1,201 | 451 | 19.9 | 423 | 31.0 | 2,475 | 141 | 46.1 |
| 1934 | 32,521 | 13,280 | 45,801 | 19.6 | 20,232 | 1,166 | 417 | 19.3 | 319 | 25.3 | 2,217 | 145 | 39.8 |
| **Northwestern Region:** | | | | | | | | | | | | | |
| Chi. & North Western 1935 | 42,196 | 23,165 | 65,361 | 11.8 | 23,776 | 1,568 | 558 | 21.5 | 244 | 17.4 | 1,892 | 120 | 41.0 |
| 1934 | 43,536 | 17,719 | 61,255 | 12.3 | 23,592 | 1,545 | 542 | 21.0 | 276 | 20.8 | 2,003 | 114 | 41.4 |
| Chicago Great Western 1935 | 2,160 | 2,927 | 5,087 | 3.3 | 32,714 | 1,760 | 622 | 21.7 | 857 | 64.8 | 2,994 | 122 | 72.9 |
| 1934 | 2,287 | 2,904 | 5,191 | 2.2 | 35,652 | 1,928 | 646 | 20.0 | 837 | 68.9 | 2,970 | 119 | 74.2 |
| Chi., Milw., St. P. & Pac. 1935 | 49,898 | 15,703 | 65,601 | 2.8 | 26,320 | 1,653 | 649 | 24.7 | 368 | 24.3 | 2,169 | 115 | 62.8 |
| 1934 | 57,110 | 14,963 | 72,073 | 5.3 | 24,882 | 1,571 | 580 | 22.3 | 304 | 22.3 | 1,967 | 114 | 47.3 |
| Chi., St. P., Minneap. & Omaha 1935 | 1,833 | 6,839 | 8,672 | 9.8 | 18,177 | 1,251 | 490 | 22.5 | 335 | 21.5 | 1,772 | 112 | 44.6 |
| 1934 | 2,181 | 6,926 | 9,107 | 10.2 | 18,336 | 1,242 | 493 | 23.1 | 346 | 22.6 | 1,908 | 105 | 45.0 |
| Great Northern 1935 | 41,694 | 8,792 | 50,486 | 9.7 | 34,419 | 2,139 | 987 | 30.4 | 398 | 20.5 | 2,435 | 106 | 34.9 |
| 1934 | 42,052 | 8,904 | 50,956 | 9.7 | 32,156 | 2,061 | 907 | 29.1 | 416 | 23.0 | 2,544 | 107 | 40.6 |
| Minneap., St. P. & Sault St. Marie 1935 | 13,784 | 3,989 | 17,773 | 4.7 | 20,670 | 1,265 | 538 | 23.3 | 330 | 20.3 | 1,366 | 99 | 73.3 |
| 1934 | 16,377 | 3,064 | 19,441 | 4.6 | 19,943 | 1,265 | 525 | 23.9 | 296 | 19.1 | 1,341 | 99 | 69.4 |
| Northern Pacific 1935 | 33,741 | 4,039 | 37,780 | 11.8 | 28,383 | 1,692 | 657 | 23.0 | 309 | 20.1 | 1,819 | 136 | 45.7 |
| 1934 | 39,462 | 4,115 | 43,577 | 14.1 | 27,692 | 1,656 | 626 | 22.9 | 311 | 20.7 | 2,116 | 149 | 49.0 |
| Oreg.-Wash. R. R. & Nav. 1935 | 7,192 | 1,728 | 8,920 | 8.0 | 21,844 | 1,301 | 489 | 21.0 | 280 | 19.2 | 1,193 | 148 | 46.2 |
| 1934 | 8,195 | 2,207 | 10,402 | 4.0 | 22,222 | 1,341 | 486 | 20.6 | 229 | 16.9 | 1,115 | 149 | 44.2 |
| **Central Western Region:** | | | | | | | | | | | | | |
| Alton 1935 | 2,527 | 6,402 | 8,929 | 20.6 | 32,353 | 1,401 | 468 | 21.9 | 328 | 25.4 | 3,175 | 111 | 69.5 |
| 1934 | 3,249 | 6,146 | 9,395 | 23.1 | 29,089 | 1,356 | 444 | 21.3 | 312 | 24.9 | 3,177 | 117 | 73.1 |
| Atch., Top. & S. Fe (incl. G.C. & S.F. & P. & S.F.) 1935 | 72,769 | 10,391 | 83,160 | 12.4 | 31,666 | 1,678 | 542 | 19.5 | 344 | 27.8 | 2,151 | 116 | 58.6 |
| 1934 | 77,211 | 10,086 | 87,297 | 12.8 | 32,109 | 1,786 | 612 | 21.3 | 375 | 28.2 | 2,461 | 102 | 57.0 |
| Chicago, Burl. & Quincy 1935 | 31,493 | 11,999 | 43,492 | 8.2 | 25,871 | 1,520 | 656 | 25.2 | 526 | 32.3 | 2,550 | 119 | 70.7 |
| 1934 | 35,415 | 11,980 | 47,395 | 9.9 | 25,872 | 1,475 | 601 | 23.9 | 466 | 31.6 | 2,430 | 113 | 70.5 |
| Chi., Rock I. & Pac. (incl. Chi., Rock I. & Gulf) 1935 | 29,980 | 11,608 | 41,588 | 15.5 | 24,027 | 1,390 | 494 | 21.4 | 378 | 28.8 | 1,895 | 128 | 51.9 |
| 1934 | 33,583 | 10,474 | 44,057 | 21.7 | 24,421 | 1,409 | 505 | 22.0 | 406 | 30.6 | 2,149 | 121 | 61.8 |
| Denver & Rio Gr. Wstrn. 1935 | 13,300 | 2,801 | 16,101 | 4.8 | 24,462 | 1,603 | 673 | 24.7 | 274 | 16.2 | 1,707 | 153 | 37.2 |
| 1934 | 14,052 | 2,396 | 16,448 | 5.3 | 25,476 | 1,658 | 686 | 23.7 | 264 | 16.0 | 1,697 | 158 | 32.2 |
| Los Angeles & Salt Lake 1935 | 4,345 | 1,063 | 5,408 | 9.0 | 30,420 | 1,740 | 629 | 20.9 | 574 | 41.0 | 2,535 | 137 | 69.4 |
| 1934 | 5,018 | 1,074 | 6,092 | 9.6 | 30,208 | 1,767 | 663 | 23.4 | 610 | 42.0 | 3,015 | 139 | 79.8 |
| Oregon Short Line 1935 | 8,069 | 2,830 | 10,899 | 25.9 | 26,224 | 1,472 | 553 | 22.4 | 425 | 30.0 | 1,866 | 112 | 52.4 |
| 1934 | 8,406 | 2,415 | 10,821 | 21.2 | 24,924 | 1,438 | 524 | 21.6 | 357 | 26.3 | 1,569 | 116 | 45.0 |
| Southern Pacific—Pacific Lines 1935 | 34,214 | 25,018 | 59,232 | 8.4 | 34,433 | 2,121 | 666 | 19.8 | 439 | 36.1 | 3,021 | 99 | 60.3 |
| 1934 | 35,321 | 23,501 | 58,822 | 9.6 | 33,888 | 2,118 | 685 | 20.3 | 487 | 39.0 | 3,326 | 101 | 60.2 |
| Union Pacific 1935 | 24,530 | 8,213 | 32,743 | 18.5 | 48,293 | 2,041 | 739 | 20.9 | 616 | 44.1 | 5,616 | 108 | 74.8 |
| 1934 | 24,158 | 7,347 | 31,505 | 19.7 | 48,903 | 2,102 | 689 | 20.0 | 560 | 46.3 | 4,686 | 104 | 65.6 |
| **Southwestern Region:** | | | | | | | | | | | | | |
| Mo.-Kans.-Texas Lines 1935 | 5,829 | 3,845 | 9,674 | 3.5 | 27,734 | 1,583 | 538 | 20.6 | 659 | 52.3 | 1,942 | 82 | 62.7 |
| 1934 | 7,923 | 3,703 | 11,626 | 2.5 | 30,216 | 1,641 | 544 | 19.7 | 576 | 47.3 | 2,040 | 81 | 55.8 |
| Missouri Pacific 1935 | 18,418 | 17,428 | 35,846 | 3.9 | 29,110 | 1,653 | 621 | 23.1 | 588 | 40.0 | 2,923 | 118 | 66.5 |
| 1934 | 22,180 | 17,654 | 39,834 | 4.0 | 30,596 | 1,709 | 630 | 22.9 | 551 | 39.0 | 2,997 | 112 | 66.9 |
| St. Louis-San Francisco 1935 | 21,369 | 5,585 | 26,954 | 5.7 | 22,024 | 1,255 | 485 | 23.1 | 379 | 26.0 | 2,047 | 127 | 48.7 |
| 1934 | 22,244 | 4,835 | 27,079 | 7.1 | 23,591 | 1,352 | 519 | 23.7 | 403 | 27.8 | 2,145 | 122 | 45.4 |
| St. Louis Southwestern Lines 1935 | 3,543 | 3,978 | 7,521 | 6.0 | 29,121 | 1,532 | 457 | 18.0 | 537 | 50.5 | 2,275 | 87 | 76.8 |
| 1934 | 4,529 | 3,251 | 7,780 | 8.6 | 29,745 | 1,598 | 467 | 17.2 | 537 | 51.6 | 2,322 | 84 | 71.4 |
| Texas & New Orleans 1935 | 7,424 | 11,170 | 18,594 | 7.7 | 24,411 | 1,395 | 458 | 20.4 | 396 | 32.4 | 1,666 | 91 | 55.8 |
| 1934 | 8,092 | 11,575 | 19,667 | 7.8 | 24,877 | 1,412 | 470 | 20.7 | 403 | 32.7 | 1,777 | 86 | 56.5 |
| Texas & Pacific 1935 | 2,761 | 4,641 | 7,402 | 5.3 | 31,391 | 1,879 | 563 | 19.2 | 698 | 63.4 | 2,655 | 79 | 41.7 |
| 1934 | 3,544 | 4,664 | 8,208 | 7.6 | 30,463 | 1,903 | 585 | 19.6 | 616 | 53.9 | 2,598 | 81 | 36.9 |

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